THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

VOL. XX. No. 481—23RD YEAR.] LONDON, MARCH 14, 1871. [Subscription per Annum. 15s. in Advance. 18s. Credit.] DOUBLE No. Price 1s.

RAMSAY'S NEWCASTLE CANNEL COAL. Analysis—10,000 cubic feet of gas per ton of coal; 26-candle gas; 13¼ cwts coke per ton of coal.

RAMSAY'S PATENT CONDENSED COKE.
DO. GARESFIELD COKE.

RAMSAY'S FIRE-CLAY ARTICLES.

GAS-RETORTS, introduced 1828. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.

Manufactories—Derwenthaugh, Swalwell, and Hebburn Quay, near Newcastle-on-Tyne; and London Wharves—Falcon Wharf, No. 80, Bankside; and Honduras Wharf, Cubit Town. Large stocks kept.

Address G. H. RAMSAY, NEWCASTLE-ON-TYNE.

GEORGE GLOVER & CO.,

Patentees of the Standard Gasometers for the Government, and of the

IMPROVED DRY GAS-METERS.

These Meters are warranted to measure correctly and not to vary. Their acknowledged superiority has brought them into general use more rapidly than any Meters hitherto manufactured.

To meet the increasing demand, G. GLOVER AND CO. have just entered on possession of extensive premises adjoining their present Works in Ranelagh Road, and they are now prepared to execute promptly, orders to any extent. They keep in stock all sizes of Meters up to 200 lights. In cases of haste, on the receipt of a telegram early on one day, their Meters can be delivered next day in any part of England, and in the large towns in Scotland.

Particulars and lists of prices forwarded on application to—

RANELAGH ROAD, PIMLICO, LONDON, S.W.;
236, GEORGE STREET, GLASGOW;
OR
15, MARKET STREET, MANCHESTER.

COWEN'S PATENT FIRE-CLAY RETORTS.

JOSEPH COWEN and CO.,

BLAYDON BURN, NEAR NEWCASTLE-ON-TYNE,

Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and OTHER OBJECTS in FIRE-CLAY," and they have also been awarded in the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."

J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts in the United Kingdom; and orders for Fire-Clay Retorts of all shapes and dimensions, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.

COWEN'S GARESFIELD COALS.
Coal Office,
QUAY SIDE, NEWCASTLE-ON-TYNE.

FIRST PRIZE IN THE PARIS EXHIBITION.

JOHN RUSSELL and CO.,

THE OLD TUBE-WORKS,
CHURCH HILL, WEDNESBURY;
ALMA WORKS,
WALSALL, STAFFORDSHIRE;
and 69, UPPER THAMES STREET, LONDON,

Original Manufacturers of Wrought-Iron Gas-Tubes, and Holders of the present Patents; Inventors and First Makers of LAP-WELDED FLUES for Steam-Boilers.

J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water, and the largest orders may be executed in a few days.

Gun Metal, and all other kinds of Cocks, Stocks, Dies, and Taps, Galvanized Tubes, &c.

N.B.—All goods thoroughly tested before sent out, and warranted.

JOHN BENT & SON,

WET AND DRY GAS-METER
AND
STREET-LAMP
MANUFACTURERS,
BELL BARN ROAD, BIRMINGHAM.
ESTABLISHED 1830.

All materials found for the alteration of Public Lamps for lighting with the Rod. Regulators with Lava Burners.

BLAYDON BURN AND LOW BENWELL FIRE-CLAY RETORT AND FIRE-BRICK WORKS,
NEAR NEWCASTLE-ON-TYNE.

WILLIAM COCHRAN CARR begs most respectfully to thank the Metropolitan, Provincial, and Continental Gas Companies for their patronage for several years past, and to intimate that he has rebuilt and enlarged his extensive premises for the manufacture of CLAY RETORTS; and that he is now prepared to execute the largest orders with punctuality and despatch. Orders for FIRE-CLAY RETORTS, of all shapes and sizes, FIRE-BRICKS, and all other articles in Fire-Clay, executed on the shortest notice, and on the most reasonable terms.

London Agents: JAMES LAWRIE & CO.,
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CANNEL COAL FACTORS.

J. & W. ROMANS, of Edinburgh and London, in returning thanks for the confidence hitherto reposed in them, beg to intimate that they have extended their Colliery connexion for the supply of SCOTTISH CANNELS, and have taken a lease of the CROWN WHARF, LIMEHOUSE CUT, LONDON, where these rich Coals can be obtained at the lowest prices.

Messrs. ROMANS, being lessees of several Gas-Works in Scotland, have their Cannels tested in the ordinary working-process-way of gas-making, thus securing for their customers additional guarantee, beyond mere laboratory experiments.

Contracts made to supply any quantity, and analysis sent, on application to the Offices, 53, Frederick Street, EDINBURGH, or 1, Walbrook, Mansion House, LONDON.

Shippers of steam and house Coal, entered on the Government list. Freightage secured on best terms.

LESMAHAGO GAS COAL,

AUCHINHEATH COLLIERY,

LESMAHAGO N.B.

JAMES FERGUSON & CO.

LESSEES SINCE 1832.

LONDON AGENTS:
JAMES LAWRIE & CO.
63, OLD BROAD STREET, E.C.

CONTINENTAL AGENTS:
LA COUR & WATSON,
LEITH.

CROLL'S DRY GAS-METER,

PRIZE MEDALS.
LONDON, 1851;
NEW YORK, 1853;
PARIS, 1855.

(INVENTED & PATENTED IN 1844,)
COMBINING ALL THE LATEST IMPROVEMENTS,
MANUFACTURED ONLY BY

PRIZE MEDALS.
LONDON, 1862;
DUBLIN, 1865;
PARIS, 1867.

THE GAS-METER COMPANY, LIMITED,

238, KINGSLAND ROAD, LONDON, N.E.

MEDAL AWARDED, EXHIBITION, 1862, "FOR GOOD WORK."

THE IMPERIAL TUBE COMPANY, BIRMINGHAM,

MANUFACTURERS OF

WROUGHT-IRON TUBES & FITTINGS, BRASS & COPPER TUBES,

GALVANIZED & GLASS ENAMELLED TUBES & FITTINGS,

LAP-WELDED IRON & BRASS BOILER-TUBES, ETC., ETC.

Twyere Coils for Blast Furnaces, Boring Tubes, Core Bars, Gun-Metal and other Cocks, Boiler Mountings, &c.

HUGHES'S PATENT TAPS FOR HIGH PRESSURES.

HENRY HOWARD & CO.,

COOMBS WOOD PATENT TUBE-WORKS,

OLD HILL, near DUDLEY,

MANUFACTURERS OF

HOWARD'S PATENT IMPROVED WROUGHT-IRON TUBES,

FOR GAS, STEAM, AND WATER;

Also ORDINARY WELDED WROUGHT-IRON TUBES and FITTINGS,

FOR GAS, STEAM, & WATER, EITHER BLACK, GALVANIZED, OR ENAMELLED.

CORE BARS FOR IRONFOUNDERS, STOCKS, TAPS, AND DIES, IRON COCKS, &c.

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SILVER MEDAL, PARIS EXHIBITION, 1867.

LLOYD AND LLOYD,

ALBION TUBE-WORKS, BIRMINGHAM,

MANUFACTURERS OF

WROUGHT-IRON TUBES AND FITTINGS

For Gas, Steam, Water, &c.

SOLE LICENSEES for the United Kingdom for the LAVENANT PATENT ENAMELLED TUBES & FITTINGS,

the Coating of which does not shell off, is a certain preservative from rust, and resists all effects of expansion and contraction.

LAP-WELDED IRON & HOMOGENEOUS METAL TUBES

For Locomotive, Marine, and Stationary Boilers.

Boiler-Tube Ferrules, Gun-Metal Gland Cocks, Water-Gauges, Whistles, &c.; Stocks, Taps, and Dies for Screwing, and Gas-Fitters Tools of all kinds.

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WAREHOUSES:

LONDON: No. 157, Upper Thames Street, E.C. LIVERPOOL: No. 63, Paradise Street. MANCHESTER: Barlow's Croft, Chapel Street, Salford. PARIS and LILLE.

ECONOMY IN GAS PURIFICATION. A PURER GAS AT LESS COST, AND GREAT SAVING IN LABOUR.

M'DOUGALLS' PRECIPITATED PEROXIDE OF IRON.

The above Oxide is now in use at some of the largest works in the kingdom, and has gained a decided preference, owing to its efficiency, cheapness, and the great saving in labour effected by its use.

It is a pure artificial Hydrated Peroxide, with an addition of only sufficient sawdust to give it the needful lightness or porosity to prevent pressure, and every particle is available for use.

In selecting an oxide, a point more important than its price, is to learn the cost of labour entailed in its use. Whilst at large works the cost of labour for purifying, where lime alone or the natural oxides are employed, is 2d. to 3d. per ton of coals, by the use of the above Oxide it is reduced to 1d. to 1½d., owing to the purifier's working so much longer when charged, and to rapid revivification—two points of special importance in the busy season.

For export to Foreign Works it is unequalled, every particle being available, and saves freight over less concentrated materials.

NOTE.—It is important to note that only the Hydrated Peroxide of Iron is useful, simple oxide being worthless. Inferior oxides show a large per centage of simple oxide, but very little Hydrated Peroxide.

M'DOUGALL BROTHERS,

LONDON—158, LEADENHALL STREET, E.C. MANCHESTER—68, PORT STREET.

E. J. & J. PEARSON,

DELPH & TINTAM ABBEY FIRE-CLAY & BRICK WORKS,

STOURBRIDGE,

PROPRIETORS OF

BEST GLASS-HOUSE POT & CRUCIBLE CLAY;

MANUFACTURERS OF

GLASS-HOUSE POTS, CRUCIBLES, GAS-RETORTS, & FIRE-BRICKS OF EVERY DESCRIPTION.

TRADE MARK.

THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

CROWN TUBE-WORKS,

WEDNESBURY, STAFFORDSHIRE.

WAREHOUSE: SOUTHWARK STREET, LONDON.

JAMES RUSSELL & SONS, LIMITED,

PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

MANUFACTURERS OF

TUBES and FITTINGS for GAS, STEAM, and WATER;

LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;

HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.;

GAS-FITTERS TOOLS, VALVES, COCKS, &c.

THOMAS PIGGOTT & CO.,

(Established 1822,)

SPRING HILL, BIRMINGHAM,

MANUFACTURERS OF

TELESCOPIC & SINGLE GASHOLDERS,

CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

CAST AND WROUGHT IRON GIRDERS, BRIDGES, AND ROOFS,

STEAM-ENGINE BOILERS, & GENERAL WROUGHT-IRON WORK.

London Agents: **PORTER and LANE, 172, FENCHURCH STREET, E.C.**

D. BRUCE PEEBLES & CO.,

ENGINEERS, WET AND DRY GAS-METER MANUFACTURERS,

BRASSFOUNDERS, & GAS APPARATUS MANUFACTURERS,

FOUNTAINBRIDGE WORKS, EDINBURGH.

SOLE MANUFACTURERS OF

Peebles' Patent Wet and Dry Gas-Meters in Tin-Plate Cases, with Tongue and Groove Joints.

IMPROVED WET METERS IN CAST-IRON CASES.

STATION-METERS, GOVERNORS, EXPERIMENTING METERS, PHOTOMETERS, PRESSURE-GAUGES, &c.

C. & W. WALKER'S GAS-VALVES.

These celebrated Valves of all kinds have been in use for so many years, and are so well known, that a description is unnecessary They are made of all kinds to suit all the requirements of engineers.

Midland Iron-Works, Donnington, near Newport, Shropshire; 8, Finsbury Circus, London.

TO GAS COMPANIES, ENGINEERS, AND MACHINISTS.

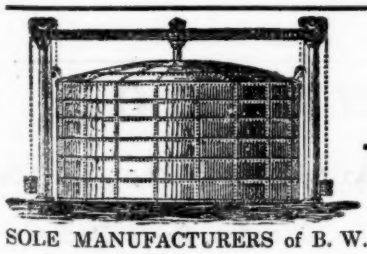
NEW LUBRICATING OIL.

This Oil is suitable for every kind of machinery, being entirely free from anything liable to produce corrosion, and is equal in lubricating power to sperm or lard oil (though supplied at half the cost).

It is prepared in two consistencies—viz., LIGHT MACHINE OIL, for machinery where the pressure is moderate and the motion rapid. HEAVY MACHINE OIL, on machinery where the motion is comparatively slow.

Samples sent for trial free of charge.

WALTER CARSON & SONS, Belle Sauvage Yard, Ludgate Hill, London, E.C.;
21, BACHELORS WALK, DUBLIN.



IMPROVED GAS APPARATUS,

FOR CITIES, TOWNS, VILLAGES, &c.,

INVENTED AND MANUFACTURED BY

W. C. HOLMES & CO.,

WHITESTONE IRON-WORKS, HUDDERSFIELD.

SOLE MANUFACTURERS of B. W. THURSTON'S IMPROVED SCRUBBER, CONDENSER, and WASHER, in use in many of the principal Gas-Works on the Continent.

PATENTEES of the IMPROVED COMBINED PURIFYING APPARATUS, so eminently adapted for Exportation.

ESTIMATES, PLANS, and SPECIFICATIONS PREPARED for BUILDINGS and APPARATUS.

Prospectus, Price Lists, &c., on application.

LONDON OFFICES—57, GRACECHURCH STREET, CITY.

*** *Please address letters to Huddersfield.*

REFERENCES TO NEARLY 300 GAS-WORKS.

THE FARNLEY IRON COMPANY, LIMITED,

FARNLEY, near LEEDS.

Since they so largely extended their Works, the F. I. Co. have experienced a most important increase in the demand for their Fire-Clay Retorts, which they owe chiefly to the superior quality of their make, and to the facilities they now possess for executing orders promptly, either for *home* or for *export*.

The Fire-Clay raised from the Farnley Estate (commonly called the Wortley bed) is unsurpassed by any other known in the district, and is peculiarly well adapted for Retorts, Gas-Ovens, and Fire-Bricks; and the F. I. Co. beg especially to invite those connected with Gas-Works, who have not yet used their Retorts, to be good enough to favour them with a trial.

The F. I. Co. generally hold in stock, for immediate supply, FIRE-BRICKS of every size and kind, White Facing Bricks, the White, Buff, and other GLAZED Bricks, in various colours and shapes, now extensively used for *Engine-houses*, Business Premises, as well as for Domestic and Public Buildings.

Prices, Drawings, and all other information may be obtained by applying *as above*; to the

Offices, 3, Westminster Chambers, Victoria Street, S.W.; or to F. Sutton, 46½, Queen Street, Hull.

N.B.—The Farnley Iron Company, Limited, give notice that they have the exclusive right of manufacture and sale of

"FRASER'S PATENT RIBBED" FIRE-CLAY RETORTS,

BY SPECIAL AGREEMENT WITH THE PATENTEE.

KING BROTHERS,

STOURBRIDGE FIRE-BRICK AND RETORT WORKS.

KING BROTHERS beg especially to call the attention of Gas Companies to the superiority of their Retorts, which are made from the celebrated STOURBRIDGE FIRE-CLAY. Mr. King has patented a Kiln for burning Retorts, by which Patent all Cold Air is excluded from the Kiln while burning, thus rendering them FREE FROM CRACKS AND CORRECT IN FORM. By great care in Manufacturing, combined with the advantages in burning, a VERY SMOOTH SURFACE is obtained, rendering them less liable to carbonize.

Retort Ovens, Fire-Bricks, Guards, Saddles, Rabbitted Burs, Flues, and Quarries, are all Manufactured of the same quality of Clay.

Every Retort and Brick is branded "King Brothers, Stourbridge."

Agent in Ireland—Mr. JAMES FURNESS, No. 3, FOWNES STREET, DUBLIN.

WILLIAM INGHAM AND SONS,

WORTLEY FIRE-BRICK AND RETORT WORKS,

Near

Leeds.

W. INGHAM and SONS, having for many years been extensively engaged in the Manufacture of

RETORTS AND FIRE-BRICKS FROM THE CELEBRATED WORTLEY FIRE-CLAY

beg to call especial attention to their RETORTS, which have for many seasons proved to be unsurpassed in quality by any in the Kingdom, their FREEDOM FROM CRACKS and the ADHESION OF CARBON rendering them worthy the attention of all parties interested in the making of Gas.

The Works are of such magnitude as to ensure the prompt execution of orders to any extent.

Estimates for Setting, or Bricklayers sent when required.

GAS OVENS IN SEGMENTS OF EQUAL QUALITY.

A large Stock of Fire-Bricks, Fire-Clay, Terra Cotta, and Drain-Pipes of all Sizes kept in London at Mr. ALFRED WILLIAMS, Wharf, 64, Bankside, Southwark, where all particulars of Prices, &c., may be obtained.

N.B.—*Export orders continue to have prompt attention.*

C. & W. WALKER'S

WOOD SIEVES FOR PURIFIERS

Have now been in use for more than ten years, and their advantages and durability fully established. They are made entirely by steam machinery in very large quantities at the most moderate cost.

Midland Iron-Works, Donnington, near Newport, Shropshire; 8, Finsbury Circus, London.

GEORGE SKEY AND CO.,

LIMITED,

WILNECOTE WORKS, NEAR TAMWORTH,

MANUFACTURERS OF

Fire-Clay Retorts, Fire-Bricks, Furnace Bricks, Lumps, Burrs, Tiles, Quarries, Grate Backs, Crucibles and Chemical Apparatus;

Glazed Stoneware Sewerage Pipes, Invert Blocks, Traps, Syphons, &c.

SOLE AGENT FOR FIRE-CLAY RETORTS AND GAS COMPANIES FIRE GOODS.

THOMAS PROUD, Gas Engineer,

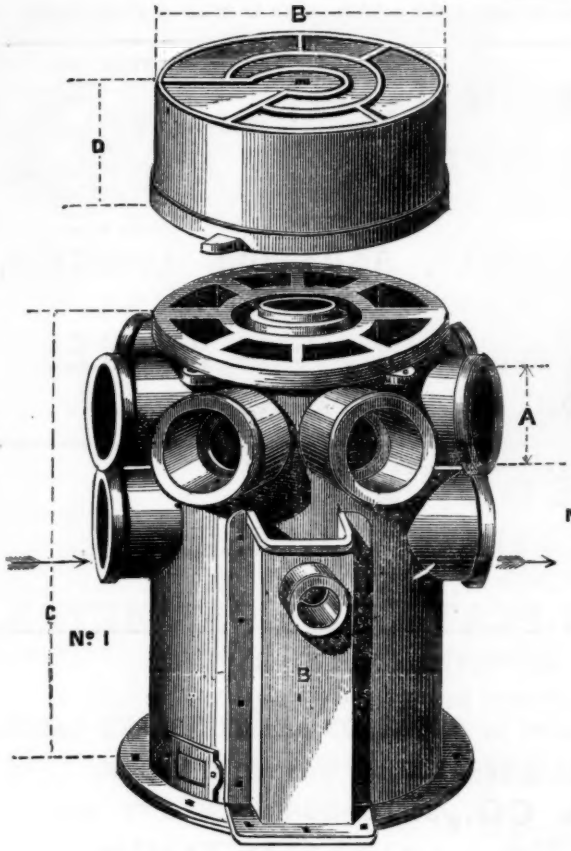
7, UNETT STREET, ST. GEORGE'S, BIRMINGHAM.

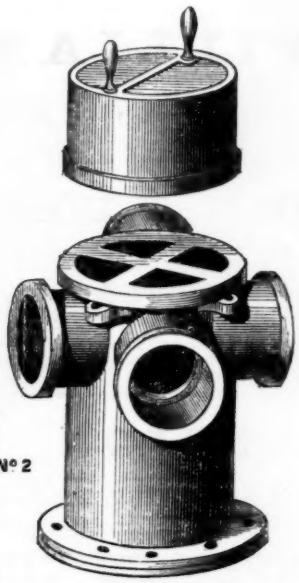
THE THORNCLIFFE IMPROVED CENTRE-VALVE,

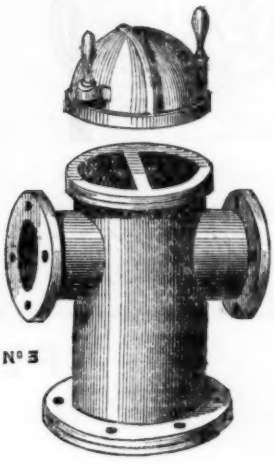
MANUFACTURED BY

MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.







THORNCLIFFE IMPROVED BYE-PASS VALVE.

SIZES

From 3 ins. upwards.

THORNCLIFFE IMPROVED STOP-VALVE.

SIZES

From 3 ins. upwards.

Sizes of the

THORNCLIFFE IMPROVED CENTRE-VALVE.

		Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
A	Bore of Pipe...	4	5	6	7	8	9	10	12
B	Diam. of Body.	16	20	23	26	28	31	34	40
C	Height of Tank.	33	35	38	43	46	48	51	56
D	Depth of Cover.	8	9	10	11	12	13	14	16
	Total height...	41	44	48	54	58	61	65	72

In all cases the Covers are cast heavy enough to resist any required pressure.

The advantages derived from the adoption of these Valves are so manifest and cardinal that in the immediate character of the change—the simplicity of the machine—the facility affording for cleaning out connexions between Valve and Purifier—the perfect collection and delivery by suitable overflow of the ammonia, at a greatly diminished depth from ground-line over the old form of Valve—the advantage of connecting on the same level, and at any angle, or opposite to each other, the inlet and outlet pipes without dip or rise—the clear acquisition of space in the purifying-house, by being able to place the boxes nearer together, the new Valve being entirely under the floor—and lastly, though of the greatest importance, the passage of crude and unpurified gas during the change is minimized to the merest fraction, thus preventing the fouling by impure gas the delicate machinery and easily affected exposed movements of the station-meter, thereby preventing the introduction of the enemy (unpurified gas) into the gasholder. Also a dead abutment is offered to all back pressure, imparting thereby to the gauges, governors, and hydraulic seals, a steadiness of action never realized with the once famous, but now fast becoming obsolete, Hydraulic Centre-Valve.

These Valves may be made of any size to suit any position of boxes, to stand any amount of pressure, warranted and tested with gas before leaving the manufactory, prepared to work any number of boxes in rotation—say, two, three, four, five, six, or eight—and for all Valves above 12-inch ports a suitable rack-and-pinion movement is attached if preferred. These Valves (specially arranged) are applicable to inlet or outlet pipes of gasholder, to act as Bye-pass Valves to meters, governors, exhauster, condensers, scrubbers, washers, driers, and duplicate systems of hydraulic main; also to act as Stop-Valves on special mains about the works. Where it is important no impediment be offered to tar or ammoniacal liquor, the same having uninterrupted flow to the general tar-well on the works, and for which purpose the slowly changed, often disordered, and at all times obstructive Slide-Valve (challenging the best of them) is superseded by the exceedingly simple, instantaneously changed Dome-Top Valve, which also carries so marked an index, whether open or shut, at any distance from close observation, providing the Valve can be seen at all. See sketch in perspective, No. 3.

London Office—34, LONDON WALL, MOORGATE STREET, E.C.

JOHN HALL & CO.,

STOURBRIDGE,

MANUFACTURERS of FIRE-BRICKS, LUMPS, & TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

PARIS, 1867.

CLASSES 24 and 53.

WILLIAM SUGG,

GAS ENGINEER.

LONDON, 1862.

CLASSES 13 and 31.

PUBLIC LAMP GOVERNORS, LEVER COCKS, AND POLE LIGHTERS,

LAMP METERS AND BOXES.

LOWE'S JET PHOTOMETERS CAN NOW BE RATED TO 14 CANDLES.

VINCENT WORKS, VINCENT STREET, WESTMINSTER, S.W.

FULLERTON, SON, & CO.,

LONDON ROAD METER-WORKS, EDINBURGH,

SOLE MANUFACTURERS OF

THE PATENT IMPROVED TIN-PLATE DRY GAS-METER,

WITH SPECIAL FACILITIES FOR ADJUSTMENT AND REPAIR,

The principal parts of the mechanism being accessible by the removal of a single Screw.

GAS-METERS on the WET and DRY principles made in CAST-IRON and TIN-PLATE CASES.

STATION-METERS, GOVERNORS, EXPERIMENTAL & TEST METERS, GAS APPARATUS, &c.

LONDON AGENTS: THORNELOE & CO., 34, LONDON WALL, CITY, E.C.,

GAS & WATER ENGINEERS, & CONTRACTORS

FOR GAS & WATER WORKS APPARATUS.

SHOW-ROOMS AND WHOLESALE WAREHOUSE FOR

Wrought-Iron Tubes and Fittings for Gas, Water, and Steam; Chandeliers, Pendants, Lamps and Brackets; Plumbers Work, Water-Closets, Pumps, &c.; Lead, Composition, Brass, and Copper Tubes.

METERS SUPPLIED TO ORDER FROM STOCK.

MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS AND COLLIERIES,

NEAR SHEFFIELD.

CELEBRATED SILKSTONE GAS COALS.

Analyses by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

Description.	Cubic Feet of Gas per Ton of Coals.	Illuminating Power in Candles.	Coke per Ton of Coal used. Cwt.	Ash in Coke per Cent.	Sulphur in Coa per Cent.
Best Silkstone . .	10,900	17·0	12·8	2·6	1·7
Norfolk Silkstone . .	11,000	15·94	12·5	4·4	1·64
Silkstone Brights . .	11,500	14·5	12·6	7·4	1·85
Silkstone Nuts . .	10,800	15·85	12·66	6·0	0·69

NOTE.—The illuminating power of the Gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

OFFICES, 34. LONDON WALL, CITY, E.C.

TANGYE BROTHERS & HOLMAN,

10, LAURENCE POUNTNEY LANE, LONDON, E.C.;

And BIRMINGHAM (TANGYE BROS.), CORNWALL WORKS, SOHO.

SOLE MAKERS OF

MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH HOLMAN'S PATENT SELF-ACTING FASTENINGS.

Over 1000 of the Patent Retort-Lids and fastenings already supplied to the great works of the Gas Company at Beckton.

Several hundreds in use at the works of the London Gas Company.

FIG. 1.

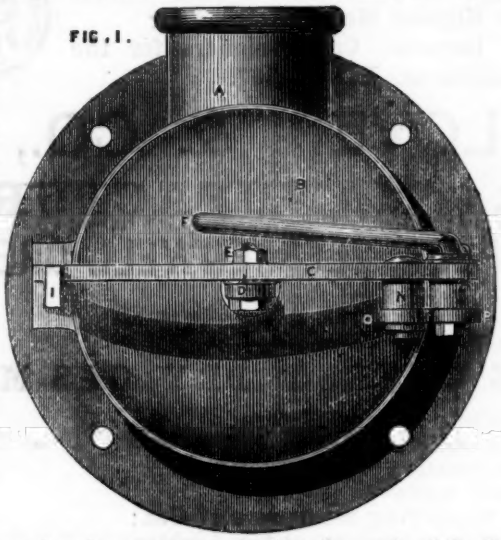
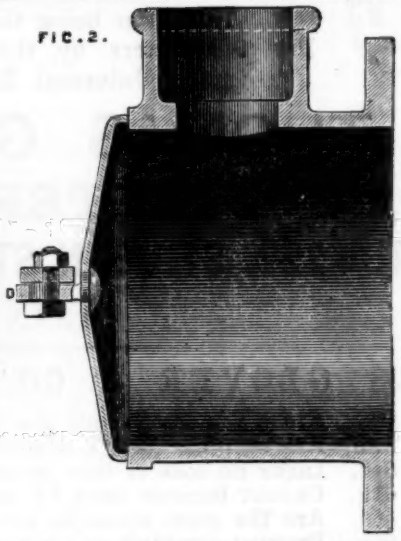


FIG. 2.



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Each one is carefully tested with Steam and Water before leaving the Manufactory.

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The number of gallons required to be lifted in a given time.

And the height of Lift from level of water to the point of delivery.

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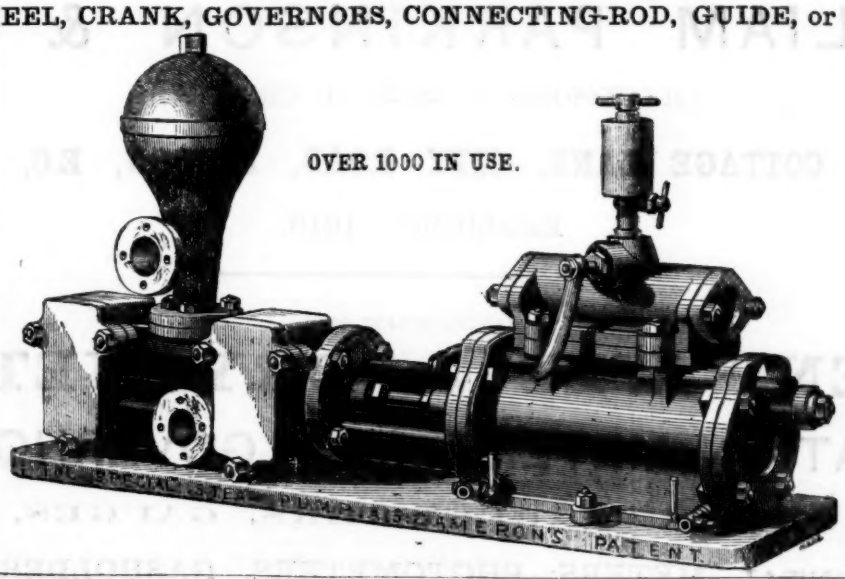

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Diameter of Water Cylinder	In.	1¼	1	3	2	3	4	—	4	6	5	6	7	4	6	7	8	6	7	8
PRICE		£10	£15	£22 10	£20	£27 10	£35	£30	£40	£47 10	£50	£52 10	£57 10	£50	£55	£65	£85	£70	£80	£100

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THE JOURNAL OF GAS LIGHTING, WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, MARCH 14, 1871.

Notes upon Passing Events.

Reform of the patent laws has cropped up again, under the management of what may really be called practical men. Mr. Samuelson, who began life as a manufacturer of agricultural implements, and made his fortune as an ironmaster, has obtained, not before it was wanted, a select committee to inquire into the "practice and effect of grants of letters patent for inventions." Mr. Samuelson wisely did not enter into any arguments on the abstract rights of man, or the sentimental side of the question; he treated it as one in which the ultimate benefit of the public had to be considered. Would the public gain or lose most by giving or abolishing the limited monopoly now granted to inventors? That is the true question. The gist of Mr. Samuelson's case is summed up in the following extract from his speech:—

> Inventors were almost invariably poor men, and were not in a condition to carry out their inventions without the assistance of capitalists, who, of course, if they advanced their money, expected to be recouped. He would mention, in the case of two important inventions, the sums expended before any return was obtained. In reference to the self-acting mule, upwards of £30,000 were spent, and upon Bessemer's improvements in the manufacture of steel £100,000 were expended in seven years before any return was obtained. He might also mention, though it was not a case with which the patent laws were concerned, that the Ordnance experiments with reference to the Armstrong and Whitworth guns cost £250,000. There was a great difference between the encouragement of new inventions and granting a patent to every frivolous matter which might be brought forward, and of which it might be said that they would soon find their own level, and not be used. He knew from experience that was not the case. There were trades in which competition existed between rival manufacturers to protect themselves and injure their neighbours by these frivolous patents. He had, in his own case, to protect himself in matters in which, if any choice had been presented to him, he should have refrained from doing so. But there was another view to be taken of these small, even though not frivolous, patents. We had to compete in the markets of other countries where these patents were not granted, and, if we had still to meet with these obstacles, we should suffer in the competition. There was another evil: patents were recklessly granted, again and again, without any examination whatever, for the same inventions which had been before the public for, perhaps, 20 or 30 years. These became stumbling-blocks in the way of the progress of manufactures. The Crown granted a monopoly or privilege, and the individual aggrieved must come forward and, at great expense, undo what the Crown never ought to have done.

But there is a difficulty in the outset in any reform of the patent laws. The law officers of the Crown derive a large revenue from the very imperfect manner in which they perform undefined duties. In 1869 the law officers received something like ten thousand pounds for their share in the preliminary inquiries before the issue of a patent. If the Attorney-General were as much overwhelmed with briefs as the Solicitor-General, we may imagine how little time he could devote to these complex duties. Mr. Samuelson contended that all that need be done could be done by a better administration of the present law, with some slight changes. The motion was seconded by Mr. Macfie, who took an entirely opposite view of the question. Mr. Macfie is, or has been, a sugar-refiner, and is, no doubt, unconsciously influenced by his trade requirements. He has found it very inconvenient not to be able to use without payment, and sometimes even when willing to pay, the latest improvements in sugar refining, which have been, in the last twenty years, both numerous and important. All manufacturers object to improvements in machinery, except under one condition. The first effect of a decided improvement is to render all the old machinery valueless. A man with a well-established profitable trade has all the benefits of a monopoly. A great improvement in machinery makes his costly plant worth only the price of old metal. If he secures the new invention, he tries an experiment, and must go to considerable expense; if he does not secure it, he runs the chance of being undersold by a more enterprising manufacturer. Therefore the average manufacturer hates all inventors, and only loves a patent when he invents it himself, or buys from some ingenious workman the right of becoming himself the patentee. Mr. Macfie quoted the case of Holland—the most uninventive country in the world—which has decided, like Joe Miller's broom-seller, "to steal his brooms ready made." Mr. Macfie raised the question of imported patents. Should an Englishman have the right of repatenting a foreign invention? In the present easy communication with all the world, this privilege seems scarcely necessary. But to deny foreigners reciprocal patent rights, is to deprive ourselves of the benefit of the ingenuity of foreigners. Mr. Macfie quoted a case where £200,000 had been paid for the use of an American invention. That only proved that the inventor had produced something which purchasers found better or cheaper, or both, than anything existing in England at the time. Mr. Macfie said that, "if we could get the use of an invention without patent "rights, the price would be considerably lower." This begs the whole question. The advocates of a sound reformed patent law say that inventions are regulated by the law of supply and demand. When inventions are wanted, inventors devote their time and money to produce them, because, when they have produced them, they expect to be repaid by a limited monopoly. No case exhibits this better than that of tapestry carpet-weaving, which has produced at half-a-crown a yard a material that looks quite as well, and lasts half as long, as Brussels carpet at five shillings a yard. Similar is the case of the power-loom carpet machines. These two inventions were hawked about by the poor inventors, who were turned with contempt from every old manufacturer's door. A company at length took up the tapestry system. The Kidderminster manufacturers only adopted the power-loom when driven to desperation by the repeated strikes of their hand-loom weavers. Mr. Mundella, engaged in the Nottingham lace business, undertook to bring before the committee many working men who had conferred great benefits on the community by their inventions. But the inventor is powerless without the capitalist, and the first thing the capitalist asks for is security that the cost of experiments and preliminary expenses will be repaid him, if they succeed, by a share in a limited monopoly. The greatest improvement in modern agriculture is steam cultivation. The late John Fowler expended more than twenty thousand pounds, and died before reaping the smallest dividend from his ingenuity and enterprise. Mr. Samuda represents exactly that class of capitalists and manufacturers who, making money out of money, do not want to be bothered or trammelled with inventors. He, however, hit the mark when he asked for some way of "preventing the grant of 'fishing patents,' "which blocked the way of the 'true inventor,' and were only "applied for that they might be bought out of the way." The Attorney-General, in the following observations, sketched with remarkable neatness the objects of the present laws, and the direction in which reforms should be effected:—

> He agreed with the commissioners that some evils were incidental to and inseparable from the patent laws, but he thought those evils were much exaggerated. Manufacturers, no doubt, objected to patents, for they would find it

inconvenient that the machinery they were in the habit of using should become obsolete in consequence of new inventions. The object of that law was the public benefit. Its purpose was to encourage men to make and publish inventions. If there were no patent law, inventors would be of two classes. The first class would consist of purely scientific men, who made discoveries for the love of truth. The second class would consist of manufacturers, who invented for their own benefit and kept their inventions secret. *But the patent law called into existence a third class, whom he might call professional inventors, who invented in order to make a profit by publishing their inventions. This last class were the creatures of the patent law, and to them was due the great part of the discoveries which were made.* It therefore would be a strong measure to destroy the law, and thereby destroy that class. The tribunal for the trial of patents might be amended by abolishing the jury and substituting assessors, and it was a fair question whether a special tribunal might not be established for their trial. He thought the process of repealing patents might be facilitated and cheapened. As the law now stands the preliminary specification alone was subject to revision, and upon that every patent was granted; but when once a man got a patent he might file a complete specification without any control. Now, that complete specification, clearly describing the nature of the invention, ought to be a condition precedent and not subsequent to the grant of the patent, and he thought an alteration of that kind would get rid of half the evils complained of. As to the preliminary examination prior to granting a patent, that was confined in ordinary cases, except where there was opposition, to ascertaining that the provisional specification clearly described one invention, and one invention only. All the provisional specifications had to be examined with great care, for it was frequently attempted to crowd half a dozen distinct patents in one specification; but he never allowed a patent unless he was satisfied that the specification described but one invention; and as the title only, and not the specification, was published, it was necessary to ascertain that the title was correct.

The first effect of compelling the inventor to file a specification clearly describing the nature of his invention *before* he obtained a patent, would be that many patents would be refused, after a search of the patents already obtained, for want of novelty. It is not very long since a patent was obtained, and extensively advertised, for a mechanical process of milking cows, which had been patented, tried, and abandoned thirty years previously. The objections to a tribunal to decide on the utility of inventions, previous to granting patents, are very strong. One of the most valuable inventions at present in use on board ships of war and merchandise is Dr. Normandy's patent for distilling salt water into fresh potable water. It is within our knowledge that this process was submitted to and condemned by two of the most eminent engineers of the day, and by the Admiralty professional adviser. Private influence caused it to be first tried on board the mail steamer *Atrato*. Since the year of that experiment the use of the patent has become all but universal. Mr. Platt, the member for Oldham, said:—

As a patentee and user of patented inventions, he believed the difficulties connected with patent law would all disappear if a proper preliminary examination were instituted. Owing to her patent system, England was now the best market for inventions, so that English manufacturers were often in possession of important improvements many years before those of any other country. That was a great advantage. Then it must be remembered that if you abolished patents you did not abolish secrecy, but encouraged it, and thereby encouraged monopoly. On the other hand, an invention on being patented was made public, and thereby the thoughts of other inventors were turned in the same channel, the result often being the production of a much more important invention. With proper discrimination in giving patents, a patent system was a great public benefit. Without such discrimination, he admitted, the system was rendered much less beneficial. This was especially true of what were known as combination patents. In such cases the parties never disclosed the parts which were new until perhaps in the course of some trial, at a ruinous cost to a manufacturer; and, indeed, it was possible even in the course of the trial that the combination might be changed. To prevent such an abuse, the parts in the specifications which were claimed as new should be coloured to distinguish them; and he agreed also that it would be well to do away with provisional specifications, and insist on complete specifications at the time the patent was granted. As to the trials of patent causes, these were almost mockeries. It was next to impossible that the judges should understand the technical questions that came before them without the help of experts; but if experts sat with them, no other alteration in the tribunal would be necessary.

There is a political point in this question it would be unwise to ignore. To abolish the reward of a limited monopoly for a valuable invention would be to say—If you are a rich manufacturer, and can beg, steal, or make an invention, you may profit by it; but if you are poor, you must sell the most valuable improvement for anything a capitalist will give—a pint of beer!

A Bill has subsequently been introduced into the House of Commons, by Messrs. Hinde Palmer, Mundella, and Hughes, to amend the law relating to patents for inventions. The principle features are—1. The appointment of three special commissioners, in addition to the judicial and official persons now concerned in the granting of patents, of whom one is to be a Queen's Counsel, and the other two of well-ascertained experience in chemical and mechanical knowledge respectively. The investigations and inquiries preliminary to the granting of a patent will be conducted in such a manner as these special commissioners may direct. If any applicant feel aggrieved at their decision, he may appeal to the Lord Chancellor. 2. At any time after three years from the date of a patent, or at any time after the validity of a patent has been established in a court of law, a patentee or his assigns may claim to have the patent registered as an "indefeasible patent," the validity of which is not to be questioned in any court whatever. The registration, however, may be opposed before the commissioners, and an appeal from their decision may be carried before the Lord Chancellor. 3. In any suit for infringement of a patent, the judge may refer it to the commissioners, whose decision will be final, unless the judge shall direct otherwise. 4. It is proposed to enact that the granting of licences by a patentee should after a given time be compulsory, at the discretion of the commissioners. 5. The stamp duties are revised, and the fees, printed in a schedule, will make the cost of an unopposed patent £12 10s., with an annual fee of £5 until the patent expires.

The proposal for establishing, at a cost of £90,000, a college, or rather a hothouse for forcing civil engineers to be exclusively employed on Indian public works, was, in its original form, a job of the most astounding dimensions. It is not so long since the College of Haileybury, in which all the most distinguished Indian civil servants were trained, was abolished, and the service thrown open to public competition; and now the Reform Government *par excellence* ask us to spend, say a hundred thousand pounds, in creating a monopoly of a scientific and practical pursuit, with all Indian public works for its prizes; or rather they did, for bit by bit the scheme has been cut down to such modest dimensions that nothing remains of the original plan except the expense. Two concessions were made—first, the prizes of Indian employment are to be open to pupils trained anywhere; and, secondly, the examiners are not to be, as originally drafted, the professors of this model engineer college, but gentlemen of independent position, including, it is to be presumed, distinguished members of the Institution of Civil Engineers. Nevertheless, in a very thin House of Commons, the scheme was condemned. It is difficult to imagine what influences could have been brought to bear on so shrewd a man as Mr. Robert Lowe, to induce him to father such a project. We shall see whether the Chancellor of the Exchequer will, after the opinion of the House of Commons, venture to include it in his Budget. If it be considered necessary to encourage the cultivation of the sciences useful to a civil engineer, at the institutions, in which future civil engineers are likely to be educated, the income of a hundred thousand pounds would be much more practically employed in founding or encouraging professorships in institutions already in existence, in Manchester, Birmingham, Liverpool, and Glasgow. The excuse for this new College of Practical Science was that candidates could not be found for the Indian service. But the ready answer was, that when the engineering business was brisk, a salary of £224, with an Indian climate, and the offensive airs of superiority of untrained and half-trained Indian military officials, was no temptation. The salaries are to be raised, and salary is dignity in India and in most places. It would be well to wait and see the effect of this measure before rushing into bricks and mortar. What is really needed in this country, and what very little Government encouragement would bring about, is more attention, in middle-class and public schools, to that kind of practical and scientific knowledge which makes a youth able to take advantage of all that is to be learned in a mechanical, manufacturing, or in the office of an engineer or an architect. If a boy on leaving school can write a good hand, can draw plans to scale, has received enough instruction to make the higher class of calculations required in designing and carrying out public works; if he has received two or three years sound instruction in mechanics, he becomes useful at once. In nine cases out of ten all the sciences which may be of any use to him in his profession are as foreign to him as Greek plays to a national school boy. He writes badly, his drawing is confined to clouded landscapes, or copies of engraved heads; he has bungled through two or three books of Euclid, and, according to his taste, a more or less intimate acquaintance with the dead, and the slightest with the living languages. Now £3000, the interest at 3 per cent. on £100,000, would give 40 scholarships, of £75 a year each, to be distributed over the kingdom as prizes, to be held for three years, and to be competed for by boys not more than 17 years of age, to be examined on a course of study to be laid down by the Council of the Institution of Civil Engineers. This would be the first rung of the ladder; the next would be the examination for Indian appointments with the increased salaries.

The difficulty, now slowly disappearing, of education in England is that all classes who succeed in raising themselves above the class of manual labour aspire to be gentlemen. Gentlemen for centuries have been educated in our public schools and universities. In these institutions only two professions have been acknowledged as worthy of encouragement—law and divinity. The way to honours and rewards has been through the exclusive study of the dead languages and mathematics in the most useless shape. These studies won all the scholarships and fellowships, and do still; for the prizes for physicial science and modern languages are mere drops in the water. Inferior schools are usually pale copies of public schools; even in the City of London, swarming with charities, there is no superior educational reward for those not intended for law, physic, or divinity. "Profit and pay on Greek and Latin wait." It must be remembered that a youth well educated for a civil engineer is well educated for the army, the navy, or any important manufacturing or mining pursuit. If, therefore, the Government is to interfere at all, it should be in the direction we have indicated, and not in creating a sort of Kew tropical house for forcing a small knot

of engineers at a cost £150 a year each. It seems that at King's College an engineering education is given for £45 a year. Of course, that is a preparatory education, to be completed by real work. We have in the scheme—supported, as a matter of course, by the courtier, Professor Playfair, M.P.—the influence of the school whose centre is at South Kensington. We willingly give up to Mr. Cole the fine arts applied to manufacture. We give him the credit of having founded one of the best art museums in Europe. Let him take music, too, if he will not ask for too large a parliamentary grant, and ballet dancing also; but leave practical science alone to strike its root into existing institutions, encouraged, if need be, by the grant of scholarships, and the prize Indian appointments.

The discussion on Mr. Candlish's motion for paying off the National Debt at a fixed rate of £10,000,000 a year brought out some figures worth recording. All European nations, like all individuals, seem to have become expensive within the last generation. At the close of the great wars, in 1814-15, it was the universal opinion of continental and many English politicians that England would sink under the load of her debt. Since that time every other state has followed our example, but Sir John Lubbock, who is answerable for the figures we are about to quote, forgot to state that a great deal of this debt has been incurred in carrying out public works and improvements, which in England is defrayed by local taxation or private enterprise. The United States alone owes all her debt to the cost of civil war:—

	1815.	1870.
North Germany owed . .	£100,000,000 ..	£150,000,000
France	70,000,000 ..	518,000,000
Austria	99,000,000 ..	300,000,000
Russia	80,000,000 ..	300,000,000
Spain	100,000,000 ..	225,000,000
Italy	50,000,000 ..	257,000,000
United States	25,000,000 ..	477,000,000
Making a total of . .	£524,000,000 ..	£2,227,000,000

And if they included other countries the grand total, according to Mr. Dudley Baxter, was no less than £3,845,000,000 in 1870, against £1,530,000,000 in 1815, showing an increase of no less than £2,300,000,000, of which the great part had been incurred during the last 20 years.

To the Chancellor of the Exchequer we are indebted for an authoritative statement of what our debt really amounts to:—

At the time of the peace of 1815 our debt was nearly £900,000,000. Since that time we have added £80,000,000 to the debt—namely, £20,000,000 for the emancipation of the slaves, £30,000,000 for the Crimean War, £10,000,000 for the Irish loan, and £19,000,000 for the Abyssinian War. I have provided myself with an accurate account of the state of the debt at the present time. The funded debt is £738,000,000, and the unfunded £4,000,000. The terminable annuities, estimated at 11 years purchase, amount to £50,000,000—making altogether about £793,000,000. It follows, therefore, that since the close of the war, and adding the £80,000,000 I have mentioned, the debt has been reduced from £980,000,000 to £793,000,000—a reduction not very far short of £200,000,000. It is not fair to accuse those who went before us of having done nothing for the reduction of the National Debt; nor can I admit that we are doing nothing in that direction, for we are paying off £50,000,000 or more by terminable annuities, and during the course of this year we have paid off £4,000,000 or £5,000,000 of debt, not including in that the payment of the £1,000,000 which were advances made by the Bank of England. I venture to submit to those who are struck with the boldness and vigour of American finance that it may be a question whether it would not have been wiser for the Americans first to restore the metallic basis, and then endeavour to lower the interest of the debt. I apprehend that that would have been the course adopted by an English finance minister.

As a matter of course, this debate brought out some familiar fallacies and exaggerations of truism—for instance, the comparison of this kingdom to an estate which has been relieved to a certain extent of the burden of a heavy mortgage by the increase of its value from the opening of a coal mine, or the construction of a canal or a railroad. No doubt England is much richer than at the peace after Waterloo, and by so much better able to pay the interest on her debt with greater ease. This view of the case may be made much stronger by showing that for a quarter of a century after the peace all the necessaries and luxuries consumed by the weekly or daily wages class were heavily taxed—salt, candles, soap, glass, bricks, timber, all the raw materials of houses and furniture, and all manufactured clothing and furniture, most articles of food, and especially corn. One set of duties only have been increased—those on gin, whisky, and other British spirits; on beer, tobacco, tea, coffee, cocoa, sugar, and wine immense reductions have been made; and from the increased consumption of these, with the addition of an income-tax, stamps, succession duties, and postage brought down to a penny and a halfpenny, the revenue of the kingdom is raised with greater results than when Custom-House duties filled a large octavo volume, and the excise officer tormented and restricted our manufactories of salt, soap, candles, glass, paper, leather, and printed calico. So much to the good. But there is another side to the question. When the taxation per head of the United Kingdom and the United States is compared, it must be remembered that the great American Republic, with her boundless resources in land uncultivated and mines unworked, has not the per centage of paupers which weighs on our resources like a nightmare. The worst is, that we are ourselves responsible for a considerable amount of this pauperism. In London pauperism grows under the stimulus of competing charitable and often religious societies. A move in the right direction has lately been made in attempts to organize local charities and put down street begging by a ticket system. But the competition between different parties and religions is constantly cropping up to oppose any substantial reform. In the rich suburbs, not only Churchmen and Dissenters establish rival charities, but in the Church itself there are rival workshops and baby-linen lending societies—this Ritualistic, that Low Church. In the heart of the metropolis, societies combine the distribution of food and clothing with attempts at conversion. A pamphlet mentioned by the *Times* gives the number of charitable soup-kitchens and free dinner-tables at 86. These cannot be all doing good. In the meantime, in certain districts of England, the demand for genuine hard-handed labour is keen—almost unlimited. The unemployed of London consist, to a great extent, of two kinds of men—those who do not want to work, and those who do not know how to do one day's work. The one would on no consideration leave London, where are their amusements and the many doles and charities to which they are accustomed. We are not surprised to hear of such—"that "all the engines on the Thames Embankment would not drag "them out of London;" or that another "would sooner *clam* "in London than live on good beef and mutton in the country." The other class are described in the letter of the railway contractor, who says: "I certainly do want men very much, but "really such men as have already come are of no possible use. "They do not seem to have been accustomed to hard work, and "are not worth two shillings a day." It is to meet the claims of the class of labourers who do not want real work that Mr. Beales, in his simplicity, asks Government to give employment in reclaiming waste land—the most unprofitable employment of capital with which we are acquainted, and certainly that for which the class of unemployed paupers of London are the least calculated. At the same time, we have often thought that an encampment and labour test, in some district remote from any town, would stop a good deal of the sort of agitation that people like Mr. Beales believe in and enjoy.

Already the mere existence of a Metropolitan School Board is producing practical results. For instance, at the annual meeting of the subscribers to the Cripplegate Within Ward Schools, held on the 15th ult., the following resolution was passed:—

That in view of the steadily diminishing resident population of the City, and of the altered state of the education question, consequent upon recent legislation, it is impossible that the ward schools can much longer be maintained in their present condition. It is, therefore, desirable that the managers of the various ward schools should confer as to the course of action to be taken under existing circumstances, and the committee of this school is requested to take immediate steps to bring about a conference.

And, consequently, a meeting was held at Zion College, to which every clergyman connected with the City, and every manager and treasurer connected with the ward schools, was invited. The zealous and liberal tone of the discussion was a remarkable sign of the times. The president—the Rev. H. Cumming—in the course of his opening remarks, suggested that the schools thinly attended should be amalgamated; those in inconvenient situations abolished, and their sites utilized; and those which were doing their work strengthened. In order to escape seeing the whole of the ward schools swept away, and superseded by rate-supported schools, he proposed "that a committee should be appointed to "draw up a plan for their more efficient working." In the discussion which followed, in which Alderman Gibbons and several clergymen took part, the feeling seemed universal that no distinction should be made between wards, or between the children of those who lived and those who only worked in the City. The Rev. W. C. Webber said that, if amalgamation were well carried out, they could provide a good education for every child within the City; and he suggested that the clothing with which it was formerly necessary to bribe mechanics to send their children to school should be abolished, as it was better "to put money in "children's hands than on their backs." One gentleman observed that if the absurdity of excluding all but ward children from ward schools in Billingsgate Ward was continued, there would soon be no children to educate, while they had a large working population, who flooded their streets by day, and sent their children to school, but left at night. One representative of the sacredness of endowments, however foolish or obsolete, was present, of course. No doubt he would maintain doles of bread and shillings paid over a tombstone, and spent in the nearest public-house. The Rev. G. Kemp thought that the money left by endowment would not be justly spent upon children coming from a distance, whose parents neither lived nor worked in the City; and if the subscribers to the schools, in reply to this opinion, said that they had schools to which they subscribed in their own immediate neighbourhood, they must be met with the answer that they made their money in the City, and lived away for their pleasure, therefore the City had a certain claim on them. It will be worth the consideration of this committee whether, as rate-supported schools will supply elementary education, some of the obsolete endowments might not be devoted to supplying and encouraging education in modern languages

and the physical sciences applicable to manufactures, as a counterpoise to the classical studies which reap all the profitable honours at the Merchant Tailors and St. Paul's Schools.

Circular to Gas Companies.

We have to regret a very serious accident which occurred to one of the gasholders at the Beckton works, on Monday, the 27th ult. The holder in question was the one nearest the river, and, with the other three, had been at work for some months, experiencing during that time the action of some heavy gales of wind, and withstanding them in a very satisfactory manner. On the morning of the 27th it was again blowing a stiff gale, and the gasholder, which was at its full height, was suddenly seen to give a lurch, resting for a moment or two, it is said, on the edge of the tank, and a great escape of gas took place. The officers in charge of the works immediately extinguished all fires and lights in the vicinity, so as to prevent the gas catching light; the gasholder gradually righted itself in the tank, and all danger seemed at an end. But in the course of an hour or so, when the holder was about half way down, the top of one of the iron columns fell on the crown, smashed it in, and at the same time struck a light, which fired the gas. A great but harmless blaze ensued, which continued till all the gas was burned—about two minutes. The cause of the accident is now under investigation. It seems probable that, when the gasholder lurched, the guide-wheels may have given a violent twist to the columns, and so have caused a fracture at a weak spot or defect in the casting. This seems the more likely as nearly all the columns are fractured. The one which fell, too, may have been insufficiently fastened to the girders. Nothing would have appeared more unlikely than the occurrence of such an accident at Beckton, where, from the knowledge that the holders would be exposed to heavy winds, an unusual number of columns were placed around to withstand the action of them. As we have said, an inquiry is in progress, in order, if possible, to ascertain the cause of the accident; and we trust, for the sake of gas engineering generally, a satisfactory explanation may be arrived at. In the meantime, we think the moral to be drawn from this and similar occurrences is, not to fill gasholders or tanks in exposed situations too full in windy weather. We have omitted to say that there was no explosion whatever, and it must be a great satisfaction to our contemporary, the *Echo*, to learn that Woolwich Arsenal was unharmed by the accident.

The annual report which the Metropolitan Board of Works is required to present to Parliament has just been issued. It is dated June 30, 1870, and was ordered by the House of Commons to be printed on the 15th of last month. The report sets forth the action taken by the Board when the amalgamations of the Chartered Company with the City of London Company, and subsequently with the Great Central, were proposed. In the former case they claim to have obtained the insertion in the amalgamation scheme of that clause which empowers the Board of Trade to require the storeage within the metropolis to cease at any time within five years; and of another provision, which makes the proceeds of the sale of the Blackfriars works, and of any compensation received for interference with those works, to go in reduction of unissued capital. In the second case, the Board report their success in obtaining stringent measures for the payment of Mr. Higgs's defalcations out of money applicable to dividend, and also some reduction of the maximum remuneration to directors.

In a section on "gas testing," the Board refer to some correspondence with the gas referees on their dilatoriness in fixing the maximum of sulphur to be allowed, and to a remonstrance with the referees on the high maximum allowed for ammonia. In defence of the delay in fixing the sulphur maximum, the referees replied that the grounds on which the maximum was fixed by the Metropolis Gas Act, 1860, were wholly erroneous, inasmuch as the test used greatly underrated the amount of sulphur; and further, that the presence of sulphur in gas was erroneously attributed to a cause which could easily be obviated. The referees, however, promised to give the question careful consideration, with a view to the adoption of some method by which the amount of this noxious impurity might be lessened. As regards ammonia, the referees admitted that it would be advantageous to the consumer to have the whole of it removed from gas before it is supplied to the public, and they promised to give effect to this opinion when the companies had had time to make necessary alterations in their works. The alterations, we presume, have been made, for we hear that the instructions of the referees for the coming summer will alter the maximum of ammonia, if not prohibit it altogether. The Board conclude this section of the report by expressing a hope that the investigations of the referees will shortly result in the discovery of processes by which gas may be rendered more free from the deleterious impurities.

As regards the testing of gas-meters, the report states that during the past year 58,195 meters have been tested by the inspectors of the Board, the fees received in respect of which amount to £1984 11s. 6d. As we see by the accounts that the expenses attending the testings have only amounted to £1 682 6s. 7d., it would appear that the Board have made a profit of £302 4s. 11d. on this branch of their business.

At the meeting of the Board on Friday last, Mr. Dresser Rogers, in pursuance of notice, moved a string of resolutions, which we append at length :—

That it be an instruction to the Parliamentary Committee to endeavour, if possible, to obtain the insertion of clauses in any new gas Bills introduced into the Houses of Parliament during the present session, for supplying any portion of the metropolis with gas, for providing—

1. That the testing burner to be used for the purpose of testing the gas for illuminating power shall be as nearly as possible like those in most general use by the consumers of gas, and that for that purpose a bat's-wing burner of an exact stated size and form be adopted (the pressure being regulated to the parliamentary standard), or one which will properly and fairly carry out the intention of the Legislature.
2. That in all cases the gas to be tested by the official gas examiners shall be supplied and taken from an ordinary distributing main, and not from an otherwise untapped main.
3. That if, in taking the testings during the prescribed hours, any one testing shall fall below the parliamentary minimum, such testing shall not be allowed in the calculation of the average power when taken.

And that the opposition to the Bill promoted by the Gaslight and Coke Company, or Chartered Gas Company, shall also include opposition to the following clauses—

1. The proposal to employ the capital of the company in making a railway for general passenger or goods traffic.
2. Clause 37, by which the capital of the Equitable Company is assumed, unless such capital is verified.
3. Clause 45. The compensation clauses being different to the scale approved by the Board of Trade in former amalgamations.
4. Clause 54 as to amalgamation, because no provision is made for reduction of unproductive capital.
5. Clauses 56 and 57. To protect the gas examiners of the Board.
6. Clause 58. Because this seems to interfere with the Board's control over the testing-places.
7. Clauses 59, 60, and 61. Because they most materially interfere with the gas legislation of 1868, and with the present action of the Board through its officers, by which the consumers are protected.

And that the committee be instructed to endeavour to obtain the insertion of clauses—

1. To provide for the sale, disuse, and removal of the works of the Equitable Company at Vauxhall, and by the reduction of the capital of the amalgamated company by the result of the sale of the same.
2. That the testing-place for the gas shall be within the area of the immediate supply.

The discussion which ensued on the introduction of these extraordinary resolutions will be found in another place. As regards the first, nothing could be more unfair than the conditions Mr. Rogers would impose on the companies. Is there, we may ask, any tradesman in the world who would consent, if he knew it, to have the goods he supplied tested by an instrument which represented them to be much below their real value? But this is just what Mr. Rogers would have done in the case of gas. The burner proper to be employed in testing is necessarily that which will evolve the most light—*i. e.*, the most accurate instrument. If it should not be the best adapted for general use, it is none the less fair, since it only expresses the truth. The public habitually make use of bad instruments, and take no pains to keep even these in the best order. The companies conscientiously supply gas which is proved to have the value of 16 or 14 candles, and the consumer makes use of a burner with which, from the same gas, he only obtains the light of 12 or 10 candles, and in many cases less. Are the companies to blame for this? To put an analogous case, who would think of compelling distillers to supply spirits of increased strength to customers who employed incorrect hydrometers in estimating the strength? But we fear it is of no use to argue with Mr. Dresser Rogers. The next resolution is directed against the clauses in the Acts which place the testing-houses within 1000 yards of the works. In some cases—now in the case of the Great Central, and as will presently be the case at the Beckton works—this regulation necessitates taking the supply for the testing-place from an otherwise untapped main. This matter was fully gone into before the regulation was made, and it was not considered unfair to the consumer. It is, however, quite open to the Metropolitan Board to have the gas tested on their own account at the farthest extremity of a supply, and when they have found a serious deterioration of quality in the gas, it will be time for them to ask to have the regulation reconsidered. The third is, perhaps, the most extraordinary of Mr. Dresser Rogers's resolutions. His notion seems to be that, to arrive at the mean of a series of numbers, you must omit the lowest from your calculations. The absurdity of this is manifest from an arithmetical point of view, but the absurdity becomes an injustice when further looked into in connexion with this matter. If the gas companies were rewarded for any excess over the standard, Mr. Rogers's proposition would be perfectly reasonable; but, as it is, they are only fined for deficiency. If the Chartered Company supplies 18-candle gas, no one thanks them; if they supply 15·9-candle gas, Mr. Rogers would remorselessly fine them. No one could blame the companies if they worked as close as possible to the standard, but that they do not is shown by the few instances

Mr. Rogers can allege in which a single testing on one evening gave results below the standard.

We may pass over most of the resolutions directed against the Bill of the Chartered Company, since it may possibly be considerably modified by the provisions of the threatened Government measure; but, as regards the fourth, we are inclined to ask what Mr. Rogers means by unproductive capital. How far can capital which was expended upon works fifty years ago be considered unproductive? Doubtless, if the London companies were to commence *de novo* with all the experience they have gained by past operations, the cost of new works would be very much less than the amount they have expended on the old ones. But would that be any reason why people who have advanced money on risk—and, indeed, still at risk—should be deprived of legitimate interest on their capital? We need not follow Mr. Rogers further, and can only express our astonishment that, even at the Metropolitan Board of Works, twelve members could be found to support his fallacies, and back him in his confiscation scheme.

The *Daily Telegraph* has commenced a series of articles intended to enlighten the metropolitan public on gas affairs. In the first, published on Friday last, the fallacy respecting unproductive capital is strongly suggested, and at the same time, we may say, completely exposed. After giving a tabular statement of the paid-up share capitals of the thirteen London companies in 1850 and 1869, with the quantity of gas sold and the net revenue of the latter year, and the dividend on ordinary shares in the two years, the writer goes on to say: "It will be seen that as much as "£6,600,000 is now invested in this industry in London only, apart "from loan capital, and that the proportion is £742 for every mil-"lion feet of gas produced. Are we sure that it is absolutely neces-"sary to have so much capital engaged in such a business? The "Manchester Corporation have only £600,000 capital invested in "the gas undertaking, being in the proportion of only £545 per "million cubic feet of gas produced." The insinuation is that one-third of the capital of the London companies is unproductive. But, as a fact, the amount expended upon the Manchester works was £810,000, which makes the proportion of capital to the production of gas much the same as in the case of the London companies. So far, then, the argument of the *Telegraph* completely breaks down. And then as regards the corporate management of gas-works, which it is the obvious intention of the writer in the *Telegraph* to advocate, what makes it "the pri-"mary duty and privilege of municipalities to supply" gas? Is it not as much their duty to supply bread and butcher's meat, the prime necessities of life? Would there not be an enormous saving of the profits of master tradesmen, and much else, if Corporations were to open co-operative stores? But most probably the loudest advocates of Corporation gas-works are the strongest opponents of co-operative stores.

The citizens of Perth—at least, a vast majority of them—we are glad to see, have arrived at the sensible conclusion that they have a very good bargain in the gas-works. Even some of the strongest opponents of the companies now admit that the Corporation have been dealt with liberally. There are, however, a few who think the prospects of the Corporation with the gas undertaking very gloomy. The most prominent of these is a Mr. Jamieson, who, when the companies have paid 8 per cent. by charging 6s. 8d. for gas, cannot believe it possible that the Corporation can make 6¼ per cent. without raising the price beyond its present rate of 5s. 10d.; but Mr. Jamieson appears to overlook the fact that, in addition to the 8 per cent., the sum of £610 was struck off the meter account, and £300 added to the suspense revenue account—together £910, or about 2 per cent. on the capital. We fail altogether to appreciate the grounds of Mr. Jamieson's belief, and can only suppose him to be one of those unfortunate individuals who are constitutionally prone to look only at the dark side of affairs. If the Corporation should fail in their undertaking, acquired on such easy terms, they will offer a striking illustration for the opponents of the corporate management of gas-works.

Paris was relighted with gas on the 3rd inst., and we are happy to learn that none of the works of the gas company have suffered in the fiery ordeal through which the city has passed. A number of our contemporary, *Le Gaz*, has also reached us. Business is fast reviving, and when the mock heroes of Belleville are quieted Paris will soon be itself again. The more we learn of the incidents of the siege, the nobler appears the conduct of the Parisians during their long and severe trial. What would have been the result of a general bombardment and an assault it is hard to say; but, as it is, history must record that Paris succumbed to famine alone.

We are informed that Mr. Arnold Taylor has reported against the issue of the provisional order applied for by the Sheerness Local Board to authorize them to borrow £5000 for the erection of gas-works, and the Home Secretary has, in consequence, refused to grant it.

Parliamentary Intelligence.

HOUSE OF LORDS.

Monday, Feb. 27, 1871.

The Glasgow Corporation Gas; Barnet Gas (No. 1); Huddersfield Improvement; Huddersfield Water; Ince Water; and Wandsworth Gas Bills, were committed.

The Chorley Improvement Bill was read a second time.

Petitions were deposited against the Barnet Gas (No. 1) Bill, from Barnet Gaslight and Coke Company; the Rev. R. R. Hutton and others; and Messrs. Douglas;—against the Dorking Gas Bill, from South-Eastern Railway Company;—against the Huddersfield Improvement Bill, from London and North-Western Railway Company; Huddersfield Gas Company; and trustees of the will of the late Duke of Leeds;—against the Huddersfield Water Bill, from the London and North-Western Railway Company; Calder and Hebble and Aire and Calder Navigation Companies; Sir J. W. Ramsden, Bart.; and T. J. Sunderland;—against the Ince Water Bill, from the Corporation of Liverpool; Committee of the Sewer Authority for Golborne; trustees under the will of the late Duke of Bridgwater; London and North-Western Railway Company; promoters of the South Lancashire Water Bill; and M. A. Maddock;—against the South Lancashire Water Bill, from Lancashire and Yorkshire Railway Company;—against the Staveley Water Bill, from the trustees of the will of the late Duke of Leeds;—against the Todmorden Gas Bill, from the inhabitants of Todmorden;—and against the Wandsworth Gas Bill, from the Metropolitan Board of Works.

Tuesday, Feb. 28.

The Standing Orders Committee reported that in the case of the Barnet Gas (No. 2) Bill the Standing Orders ought not to be dispensed with; and that in the case of the Burnley Improvement Bill the Standing Orders ought to be dispensed with, provided that the power to construct and maintain new gas-works be struck out of the Bill.

The Aberdare Gas; Kilmarnock Municipal Extension and Improvement; Todmorden Gas; and Waterford Water Bills, were committed.

The Lincoln Water-Works Bill was read a second time.

Petitions were deposited against the Aberdare Gas Bill, from the Aberdare and Aberaman Consumers Gas Company, and others;—against the Chorley Improvement Bill, from the Corporation of Liverpool; and the Lancashire and Yorkshire Railway and Lancashire Union Railway Companies;—against the Kilmarnock Municipal Extension and Improvement Bill, from the Glasgow and South-Western and Caledonian Railway Companies; and Glasgow and Kilmarnock Joint Lines Committee; owners, &c., of property, and others in Kilmarnock; and trustees of the late Alexander Hay;—against the South Lancashire Water Bill, from the Corporation of Liverpool; Tyldesley-cum-Shakerley District Local Board; and Earl of Derby and Justices of the Peace of Lancashire;—against the Staveley Water Bill, from Sheepbridge Coal and Iron Company;—and against the Todmorden Gas Bill, from the Rochdale Canal Company; and millowners and others in Todmorden.

Thursday, March 2.

The Chesterfield Water and Gas, and Boston Gas Bills, were committed.

The Dorking Gas; Staveley Water; and Cleveland Water Bills, were committed; committee to be proposed by the Committee of Selection.

Petitions were deposited against the Lincoln Water Bill, from the Great Northern Railway Company;—against the South Lancashire Water Bill, from the London and North-Western Railway Company; Earl of Bradford; Sir C. H. Tempest, Bart.; R. H. Ainsworth; Messrs. Callender and Sons; W. J. Rideout; and P. Wright and others;—and against the Staveley Water Bill, from the Midland Railway Company.

Friday, March 3.

The South Lancashire Water Bill was committed.

The Glasgow Corporation Gas Bill was reported, with amendments.

Petitions were deposited against the Lincoln Water Bill, from the Midland Railway Company;—and against the South Lancashire Water Bill, from the Hindley Local Board; Ince Local Board; and Wigan Coal and Iron Company.

Monday, March 6.

The Chorley Improvement Bill was committed.

Petitions were deposited against the Cambridge University and Town Water Bill, from F. Evans;—and against the Chorley Improvement Bill, from the London and North-Western Railway Company.

Tuesday, March 7.

The Lincoln Water Bill was committed.

The Glasgow Corporation Gas Bill was read a third time, passed, and sent to the Commons.

The Barnet Gas (No. 1); the Wandsworth Gas; the Ince Water; the South Lancashire Water; and the Staveley Water Bills, were referred to a Select Committee, consisting of Lord Mont Eagle (chairman), the Marquis of Hertford, Earl Cottenham, Lord Brodrick, and Lord Keane, who will sit on Thursday, March 16, at eleven o'clock.

The Aberdare Gas; Todmorden Gas; Waterford Water; Dorking Gas; Huddersfield Improvement; Huddersfield Water; and Cleveland Water Bills, were referred to a Select Committee, consisting of Earl Devon (chairman), Earl Airlie, the Earl of Tankerville, Lord Delamere, and Lord Seaton, who will sit on Thursday, March 16, at eleven o'clock.

Petitions were deposited against the Lincoln Water-Works Bill, from the City of Lincoln District Local Board; R. Galsworthy; R. Ellison and another; and W. Foster.

Thursday, March 9.

The Cambridge University and Town Water Bill was committed.

Petitions were deposited against the Oldbury, Smethwick, and West Bromwich Water Bill, from the Great Western Railway Company, and from the Birmingham and Staffordshire Gaslight Company.

Friday, March 10.

The Oldbury, Smethwick, and West Bromwich Water Bill was committed.

Petitions were deposited against the Oldbury, Smethwick, and West Bromwich Water Bill, from the London and North-Western Railway Company; the West Bromwich Improvement Commissioners; the Birmingham Canal Navigation Company; the South Staffordshire Water-Works Company; the Birmingham Water-Works Company; Messrs. Albright and Wilson; Messrs. Chance Brothers and Co.; and John Evans and another.

HOUSE OF COMMONS.

Monday, Feb. 27, 1871.

The Alliance and Dublin Consumers Gas; Bridgwater Water; Gaslight and Coke Company; Ilkley Gas; Rhyl District Water; and Warrington Gas Bills, were read a second time, and committed.

Petitions were deposited against the Alliance and Dublin Consumers Gas Company's Bill, from James Martin; and for dispensing with Standing

Order 127, in the case of the petition of James Martin, from E. Burrows Starkey.

TUESDAY, FEB. 28.

The BURNLEY BOROUGH IMPROVEMENT Bill was read a second time, and committed.

A petition was deposited against the ABERDEEN MUNICIPALITY EXTENSION Bill, from Old Machar Parochial Board.

WEDNESDAY, MARCH 1.

The CEFN, ACREFAIR, AND RHOSYMEDRE WATER Bill was read a second time, and committed.

A petition was deposited against the BURNLEY BOROUGH IMPROVEMENT Bill, from the Lancashire and Yorkshire Railway Company.

FRIDAY, MARCH 3.

Petitions were deposited against the BRIDGWATER WATER Bill, from Lord Northbrook and others; Earl of Besborough and others; and Lord Clifford and others;—and against the SOUTHPORT IMPROVEMENT Bill, from grave-owners in the burial-ground of Christ Church, Southport.

SATURDAY, MARCH 4.

Petitions were deposited against the BRIDGWATER WATER Bill, from Sir Henry Oglander, Bart., and officiating ministers, churchwardens, overseers, and guardians of certain parishes affected by the Bill;—and against the BURNLEY BOROUGH IMPROVEMENT Bill, from Charles Towneley.

MONDAY, MARCH 6.

The DUNFERMLINE CORPORATION WATER Bill was withdrawn.

Petitions were deposited against the BURNLEY BOROUGH IMPROVEMENT Bill, from Rochdale and Burnley Turnpike Roads Trustees; Duke of Buccleuch; Robert Townley Parker; and Robert Townley Parker and others;—and against the NEWRY BOROUGH IMPROVEMENT AND WATER SUPPLY Bill, from the grand jury of the county of Devon.

TUESDAY, MARCH 7.

The SHEPPY GAS; WATFORD GAS; DUNSTABLE GAS AND WATER; THIRSK GAS; WHITBY GAS; NORTHALLERTON BOROUGH GAS; WESTHOUGHTON GAS; and WARRINGTON GAS Bills, were referred to a Select Committee, consisting of Mr. Wegnelin (chairman), Sir Charles Adderley, Mr. A. H. Brown, Mr. Broadley, and Sir John Duckworth, who will sit on Tuesday, March 14, at twelve o'clock.

The SUTTON AND CHEAM WATER; the LOUTH WATER; the BRIDGWATER WATER; and FOLKESTONE WATER Bills, were referred to Lord Henley (chairman), Mr. Carnegie, Mr. Stapleton, and Mr. Round, who will sit on Thursday, March 16, at twelve o'clock.

The RHYL DISTRICT WATER; CEFN, ACREFAIR, AND RHOSYMEDRE WATER; BATLEY CORPORATION WATER; and ILKLEY LOCAL BOARD Bills, were referred to a Select Committee, consisting of Captain Egerton (chairman), Colonel Windsor Parker, Mr. Magniac, Mr. Assheton, and Mr. Bonham-Carter, who will sit on Thursday, March 16, at twelve o'clock.

WEDNESDAY, MARCH 8.

The FOLKESTONE WATER Bill was read a second time, and committed.

FRIDAY, MARCH 10.

The GLASGOW CORPORATION GAS Bill was read a first time.

Legal Intelligence.

COURT OF CHANCERY.—LINCOLN'S INN, FRIDAY, MARCH 10.
(*Before Vice-Chancellor Sir* JAMES BACON.)

THE ATTORNEY-GENERAL *v.* THE COUNCIL OF THE BOROUGH OF BIRMINGHAM.

This is one of the numerous informations which have been instituted in the last few years in relation to the sewage question. The relators are persons residing at and near Gravelly Hill, a suburb of Birmingham. They pray for an injunction to restrain the council from causing or permitting the sewage of the borough from being deposited at their sewage-works in such a manner as to be a nuisance to the relators, whose houses are at a distance varying from half a mile to three-quarters of a mile from the works. In 1858 a suit was instituted by Sir Charles Adderley to restrain the council from discharging sewage into the river Tame, and thus pollute that river. At that time the sewage of the town was discharged direct into the small river Tame, and its tributary, the Rea. On interlocutory motion, an injunction was granted to prevent any new drains being connected with the rivers, and liberty was given to Sir Charles Adderley to apply for an injunction to prevent the continuance of the nuisance as it then existed. The order was taken in that manner by arrangement, in order to give the council time to find other means to dispose of their sewage. This they have done by leading the sewage through two main sewers to a place without the town. Some of the sewage is, as a matter of experiment, used for irrigation. But the process by which the greater part of the sewage of Birmingham is at present disposed of is as follows:—The Borough Council have at the north-east of Birmingham, at a place called Saltley, about 20 acres of land, where they have erected two large tanks, into which the main sewers are allowed to discharge alternately, the more solid matter subsiding, and the more liquid being discharged into the river Tame, which it pollutes in a comparatively small degree. When one tank is full the sewage is diverted into the other; the solid matter is dredged out, and placed in heaps on the ground to consolidate, and, after exposure to the air for nearly a year, is sold for manure, and removed into the country as it is wanted. The amount of such solid manure annually sold is stated to be 50,000 tons, and the average daily discharge of sewage from the two main drains of the town is stated to amount to 18 million gallons.

There was the usual conflict of evidence as to the effect of the effluvia from the sewage-works on the health of the inhabitants of the neighbourhood, the scientific and other witnesses on behalf of the relators affirming that the salubrity of the district was considerably injured, and particularly that low fevers had become prevalent; while the workmen of the defendants affirmed that they had worked in the midst of the stench for years without their health being impaired, and scientific witnesses also deposed that the health of the neighbourhood was unaffected. However, the principal contention related to what period the defendants should be allowed before an injunction, if granted, should come into effect, it being considered that some suspension was necessary, in order to give time to the council to apply to Parliament, and to take other steps to procure proper means to get rid in a satisfactory way of the enormous mass of sewage they have to deal with.

Mr. JESSEL, Q.C., Mr. KAY, Q.C., and Mr. RODWELL appeared for the relators; Mr. EDDIS, Q.C., and Mr. RODWELL were instructed by Sir C. Adderley to appear on the liberty reserved in his suit, and move for an extension of his injunction; Sir ROUNDELL PALMER, Q.C., Mr. FRY, Q.C., and Mr. PHEAR appeared for the Council of Birmingham.

The VICE-CHANCELLOR was of opinion that the evidence had established the existence of a nuisance so great as even to be a danger to life and health, and seriously to interfere with the ordinary comforts of life. The only question was how long a time it would be right to give the defendants before the injunction should be put into operation. Looking to the facts that they had neglected their duties in not endeavouring to take some steps to abate, or at any rate lessen the nuisance, even during the nine months that had elapsed since the filing of the information, and that they had suggested no particular means they intended to adopt to remedy the evil, he thought it would not be right to give so long a time as had been given in the Leeds and Colney Hatch cases. He, therefore, granted an injunction in terms of the prayer of the information, to be suspended till the second day in Michaelmas Term, with liberty to the defendants to apply, in order that if they could show the court that they had used due diligence in the meanwhile, a further extension of time might be given.

Sir Charles Adderley's motion stood over till next seal.

Miscellaneous News.

CANTERBURY GAS AND WATER COMPANY.

The Ordinary Half-Yearly Meeting of Shareholders in this Company was held on Friday, Feb. 24—Mr. FAIRLEY in the chair.

The SECRETARY (Mr. Burch) read the directors' report, as follows:—

The net profit made by the company during the six months ending Dec. 31, 1870, amounts to £2014 10s. 10d., out of which sum your directors beg to recommend that the usual dividend at the rate of 6 per cent. per annum, free from income-tax, be declared on the original stock and the A and B shares, which will require the sum of £1665, and that the balance be carried to the reserve-fund.

There are now about 750 houses and cottages connected with the company's water-mains, and the present number of paying consumers of water amounts to about 500, being an increase during the last six months of 150.

Your directors are pleased to report that they have entered into a contract with the local board for the supply of water for public purposes for two years, at the yearly rental of £225.

They had hoped previous to the publication of this report to have received from their engineer all the outstanding accounts relating to the erection and completion of the water-works, so that they might have laid before the shareholders the exact statement of capital expended. There are, however, some few details still requiring adjustment before the engineer can hand over the works in their entirety to the company.

The very high opinion which has been expressed by Professor Frankland, Mr. Rawlinson, C.E., Professor Tyndall, and other eminent men who have inspected the works and tested the character of the water, must be as gratifying to the shareholders and the public as it is to your directors, and will doubtless during the present year lead to a very large increase in the number of consumers.

Your directors have pleasure in reporting that they have concluded a contract with the local board for the supply of the public lights with gas for three years. A heavy cost was incurred by the company previous to the last contract, in affixing meters to the public lamps at the request of the local board. These have now been discontinued, and a uniform charge for each lamp has been substituted. The local board has met the question of this expense in a fair spirit, by agreeing to pay £300 on account of such cost during the term of the present contract.

During the last six months Mr. R. K. Moorhouse has ceased to be the manager of the works, and Mr. Thomas May, late of the Ramsgate Gas-Works, has been appointed manager.

The retiring directors are Major Castle, Mr. Fill, Mr. Rayner, and Mr. Sharp, and they, being duly qualified, offer themselves for re-election. Mr. James William Pilcher has also given notice of his candidature for the office of director.

The increase of office work consequent on the extending business of the company will necessitate the erection of new offices. Your directors have delayed this work as long as possible, but the present accommodation falls so short of the necessary requirements that they purpose erecting suitable offices, with a weigh-bridge connected, on the site of the present court-yard and building, the cost of which will be a charge upon revenue.

The company's plant is in fair working order, and sufficient to meet the present supply of gas to the consumers.

The CHAIRMAN said he had very few observations to make upon the report. During the past six months the affairs of the company had been carried on very satisfactorily. The report showed that the company was progressing, and that there was an elasticity in its affairs, which was necessary to the success of a public company; and he hoped that prosperity which they had so long enjoyed would continue. With regard to the gas, it was a matter of satisfaction to be able to state that the leakage, which was formerly 19 per cent.—which was a very large per centage, but not larger than that of other companies—had, with care and attention, been reduced to something like 12½ per cent., and he thought there were very few other companies that had less leakage. With regard to the water, it was a matter of regret that they could not get in the accounts, so as to be able to state to the shareholders the whole amount of capital expended. But this could not be done, though they had tried hard; it was owing to there being several works to be carried out, and to many little matters of detail which, in a large concern like that, had to be worked out, and which Mr. Homersham, their engineer, wished to be done before he placed the matter entirely in their hands. The report, on the whole, he thought was very satisfactory. If they had expended a little more money than was estimated in connexion with the water, they had an article which was good in quality, and they had good works. He only hoped that time would increase the number of consumers, and that the water-works would be made a good paying concern, although its purposes were not equal to the other branch of the company. He must state that amongst the eminent men who had recently visited the water-works was Mr. Rawlinson, C.E. He (the chairman) accompanied him over the works, and, after examining them and expressing his great satisfaction, he said there was one mistake committed in regard to this new undertaking, and that was that the local board ought never to have allowed a private company to carry out these works. He also added that the local board would be wise to pay to the company every farthing that had been expended on the works, which would be an act of wisdom, if they could get the works out of the company's hands. The company did not, however, intend to sell their works, and he did not put this statement forward with any such idea, but he mentioned it that the shareholders might know that, according to the opinion of a man of great experience, the directors had expended the money well, and that they had done the work in such a manner as to give the utmost satisfaction. He regretted that it had been probable that some unpleasant proceedings would take place at this meeting in regard to the election of directors. There were four gentlemen on the board to retire by rotation, and they all, being eligible, had offered themselves for re-election. There were, however, five in the field; but he hoped the difficulty had been got over by an arrangement that had been come to. Unfortunately one of the directors had been very seriously ill for some time, and his resignation had been placed in his (the chairman's) hands. Mr. Jacobs was the gentleman he referred to. He had sent in his resignation, stating that he had found it utterly impossible to continue his duties, and therefore hoped the meeting would accept his resignation. The directors had proposed to exercise a power conferred upon them by Act of Parliament to accept the resignation, and allow Mr. Pilcher, the new candidate, to take his place, and thus avoid a contest. Mr. Jacobs had two years longer to serve, and Mr. Pilcher would hold the office for that period. He hoped this arrangement would meet with the satisfaction of the shareholders. He must say a few words about these contests. As they were aware, four directors retired by rotation every three years, and those gentlemen were perfectly eligible to seek re-election. It was in the power of any shareholder to put his name down as a candidate, but he thought it was a power that should be used very delicately. All the while the directors were carrying out the works of the company to the satisfaction of the shareholders, he did not think it was advisable to have yearly conflicts to see who should have the management. There was a great deal of work to be done, and if it was carried out satisfactorily, and the directors all worked well together, it was not advisable to change. But if unfortunately a question should arise as to the manner in which the affairs of the

board were carried out, he was clearly of opinion that the shareholders ought to substitute other gentlemen for those who might be on the board, and then they would have an opportunity of testing the question whether the directors were or were not doing their duty. Contests should only be rendered necessary when a question of principle arose. He did hope that they would not have gentlemen stepping up every year with a laudable desire to get on the board. They would excuse these remarks, but they were aware that last year Mr. Pilcher started as a candidate, but withdrew, and he was again a candidate, not, however, with a desire to question the proceedings of the directors, but merely with a view to take a seat on the board. But he hoped they had got over the difficulty this time. If they came to voting, and splitting against each other, they would very soon bring upon themselves some difficulty, and they might not have such good and uniform success as had hitherto attended their united efforts. He had been told that the directors ought to propose higher dividends, and if this question was going to be raised, he would anticipate any observations that might be made by explaining to the meeting that the directors had had for the last two or three years some fears whether they could make the dividends they had been making. They felt that if they could make dividends of 6 per cent., they would have ample surplus profits to carry on the works, and thus avoid the raising of fresh capital. This they thought was a very wise and prudent thing to do. They felt that until they got the works well consolidated, they should only pay moderate dividends, because if they granted large ones, and any trouble arose, they would be unable to meet it. He thought that while they were in this state of progression, and were making heavy outlays of capital, they would be acting wisely and prudently by paying only moderate dividends: this was far better than paying large ones, without any prospect of being able to keep them up permanently. Some gentlemen might differ from the directors with regard to the increased accommodation at the works, but the clerks duties necessitated the expenditure it was proposed to make. After detailing the alterations necessary, the chairman concluded by proposing the adoption of the report.

Mr. REID, in seconding the motion, said he undertook the duty with particular satisfaction, because he came there labouring in some little doubt with regard to the financial position of the company, but he was glad to find that their finances were in a better condition than he thought. However, he should not be anxious to see the dividends increased at present. He wished to speak upon one point, and that was with regard to the water supply. They had the very best evidence they could possibly have as to the character of the water, and they could say there was no water in the neighbourhood that did equal it. They had good water and good works, but there was some reserve put upon its distribution. He did not wish to censure the directors, but if parsimony was regarded, it rose from a want of intelligence in reference to the supply. He must say the company limited the consumers to a certain supply, for the cistern in which he received his water was a six-gallon one, and this he considered was not large enough. He did not believe the directors wished to act unfairly, and limit the supply of water to their customers, for so they would bring upon them an evil which would affect their health. The supply of water allowed to the consumers was insufficient to flush the drains and closets. It was quite absurd to have six gallons of water for the purposes for which it was supplied. He wished to impress upon the minds of the directors the necessity of allowing a better supply. He did not advocate the necessity of a great waste of water, because he looked upon that as an equivalent to the crime of waste in food, for water was an essential to every being as a matter of life. Whilst endeavouring to be economic, the company must look to the necessity of a constant and sufficient supply. He did hope that it would be found advisable to amend the arrangements the company were at present adopting, because he did not like a hard and fast line being held over all the city. The supply the company allowed might do in the lower part of the town, but in the other part, where there was a long line of service-pipe, it had a very bad result. They were peculiarly interested in such matters as this, as, sooner or later, it would become an obstacle to the company. He would again remind the directors that he had no adverse feelings in mentioning this matter, but that he did so simply to caution them, and with a view to their allowing in the future a free and liberal supply of water to the consumers.

Mr. MAYNARD called attention to the necessity of economy in the company's proceedings. He gave great credit to the directors for what they had done during the past six months, but he must object to the further outlay it was proposed to make in erecting new offices, which he considered unnecessary. He would admit the necessity of the weigh-bridge, because he thought that would pay itself; but he must object—and he was very sorry to do so—to the other work being carried out. He thought the large sum of money it was proposed to expend could be well avoided. Their capital was already extended to an enormous extent. It would be seen by the report that the water-works were in good order, but it occurred to him that if anything happened to the engine, all the works would be stopped; therefore they must necessarily have another engine, and it would be better to provide this than to erect the new buildings. He thought it was his duty to impress upon the directors the necessity of economy, and he did so with all due respect to them. He did not believe the company were in a position to carry out the proposed buildings at present.

Mr. HARGRAVE, whilst congratulating the directors upon the success that had attended their endeavours, and expressing his opinion that the directors had done everything they could to deserve the praise of the shareholders, thought they could make higher dividends. By the report it was shown that a dividend of 6 per cent. was recommended, as usual. To grant a dividend of 1 per cent. more would take £277 10s., leaving only £72 to be carried to the reserve-fund. The reason, it seemed to him, why the directors had not recommended a 7 per cent. dividend was because probably they would give offence to the public by creating dissatisfaction, as they had already got a dividend larger than hitherto. He thought very different to that.

The CHAIRMAN: I think I must ask you to mention your authority, Mr. Hargrave, because such a question never came before the board.

Mr. HARGRAVE said Mr. Rayner told him.

Mr. RAYNER: I will answer that presently.

Mr. HARGRAVE then referred to the shares not being sold. He advocated an increased dividend, in preference to the erection of new works, and moved, as an amendment to the proposition for the adoption of the report, that the new buildings be not erected until a dividend of 7 or 8 per cent. be declared.

The amendment was not seconded.

Mr. RAYNER said that, with regard to what Mr. Hargrave had mentioned, he went to him and told him that he was in favour of a larger dividend, but the directors would not make one until they were in a more flourishing condition.

Mr. HARGRAVE: That is all correct, but there was something more Mr. Rayner has not mentioned.

The CHAIRMAN, in replying to the observations of some of the speakers, remarked that, with regard to the matter Mr. Reid had referred to, he would remind them that the engineer was dictating a course to them which he considered a good one, and therefore they were obliged to act as they had done in the matter; but Mr. Reid might rely upon the directors for due and proper attention to be paid to the consumers. Respecting Mr. Hargrave's remarks about the shares, Mr. Farley said they did not like the mode of doing that which would allow parties to exchange their shares and thus make money by them. They had got no stock market in connexion with their works.

In reply to Mr. Wells, the CHAIRMAN said the directors had not as yet received any estimate of the new works it was proposed to carry out, but he believed the expense would be between £700 and £800.

At the request of Mr. Reid, the CHAIRMAN explained the working of the reserve-fund of the company.

The report and balance-sheet were then unanimously adopted.

The CHAIRMAN then proposed, and Mr. MARTEN seconded—"That a dividend of 6 per cent. be declared;" and it was carried.

Previous to the chairman putting the resolution for the re-election of the four retiring directors, and for allowing Mr. Pilcher to take the place of Mr. Jacobs,

Mr. PILCHER rose and said he would make a few remarks upon the rebuke that had been administered by the chairman as to the inadvisability of the directors being continually changed. He had no opposition to any one of the directors, but believed them to be all good men, and far better fitted for the offices they held than himself. Last year he was induced to be nominated as a candidate for the office of director, but he did not want to provoke a contest, and therefore he retired without coming before the shareholders. This year he had been asked again by many friends to allow himself to be nominated, and, as he was promised great assistance, he consented; and he was vain enough, perhaps, to believe that had there been a contest he should have been successful. But he was quite prepared to accept the arrangement that had been made for him to take the place of one whose absence from their meeting that day they must all deeply regret. If at the end of the two years they should find he had not acted to their satisfaction, he hoped they would not re-elect him.

Mr. MATTHEWS suggested that in future statistics should be supplied to each shareholder as to the number of times each director attended the board meetings.

The suggestion did not seem to find any support, and the resolution respecting the directorship was unanimously agreed to.

Mr. MAYNARD moved, and Mr. REID seconded—"That the sum of £120 be allowed the directors for their expenses during the year." Carried unanimously.

Mr. Lankester was re-elected auditor, and the usual subscriptions to the hospital and dispensary were voted.

The CHAIRMAN put before the meeting a suggestion that Mr. Amos (who is a chemist) should be appointed to inspect the water weekly, in order to see that it is the article promised the consumers, and that he be allowed £10 a year for doing this.

Mr. M. RINGSFORD pointed out that if Mr. Amos were paid for this, he would be disqualified from sitting on the board of directors, and suggested that his assistant should be appointed instead.

This suggestion was unanimously carried.

The usual vote of thanks terminated the proceedings.

WOLVERHAMPTON GAS COMPANY.

The Half-Yearly Meeting of this Company was held on Tuesday, Feb. 28, at the Offices, Queen Street—Mr. JOSEPH COOPER, chairman, presiding.

The SECRETARY (Mr. J. Homer) read the following report of the directors:—

Your directors have the satisfaction of reporting the result of the half year's working up to the 31st of December last. The accounts, as certified by your auditor, show the total receipts to have been £17,881 3s. 6d., and the expenditure, £12,947 7s. 11d., which enables your directors to recommend the declaration of the usual dividend, payable forthwith, if sanctioned by the proprietors.

The continued increased consumption of gas will, on this occasion, justify your directors in carrying into effect the hopes expressed at the last general meeting, of a further reduction in the price from 2s. 7d. to 2s. 6d. per 1000 cubic feet, from and after the 31st of March next.

The directors have pleasure in adding that the works and plant are throughout in their usual state of efficiency, and they will continue their exertions to maintain them in this most desirable condition.

Three of your directors retire at this meeting—viz., Messrs. Joseph Cooper, Benjamin Savage, and George Cox, who offer themselves for re-election. The auditor, Mr. Benjamin Smith, also retires at this meeting, but offers himself for re-election.

The CHAIRMAN, in moving the adoption of the report, remarked that at the commencement of 1857, and for several years previously, the price of gas was 5s. per 1000 cubic feet, and at the annual meeting in the February of that year the first reduction of 3d. per 1000—viz., from 5s. to 4s. 9d., took place. Since then, on various occasions, as most of them were aware, reductions of 3d., 5d., and more recently, since the price had been low, of 1d., had been declared, until now the directors had the gratification to announce that after March the price would be only one-half what it was in 1857. This, he hoped, would be satisfactory to them all. He might add that this desirable result would have been accomplished at least one or two years earlier but for the heavy legal expenses incurred by the company in defending the shareholders interests. He was also enabled to state as a fact that 2s. 6d. per 1000 was the lowest price at which gas was supplied by any company in the United Kingdom. Of course, there must be an end to reductions, as there was to everything else. What he meant was, that they could not hold out the hope of any great reduction or of any early reduction at all in the future, because they must always be prepared for contingencies, such as an increased price of coal. If the trade of the country should improve, as they expected and hoped it would, that would cause a demand in the labour market and an advance in the price of coal, which would, of course, preclude any early reduction in the charge for gas. Nevertheless, the board did not believe in finality; they did not believe that 2s. 6d. would be the lowest price attained, although they could not pretend to say that there would be any further reduction at an early period. The proprietors would be aware that a great increase in the consumption would eventually lead to a large expenditure in extra plant and works; not that he meant to say that such expenditure would be immediate, but it would come, and that was another reason why the price of gas might not be still further reduced. The increase in the consumption had really surprised them on many occasions, and he saw no reason why it might not continue to increase, so as to enable the board to make the price of gas still lower. At all events, the board would steadily pursue the policy which had resulted satisfactorily up to the present time, and he hoped the concern might be as prosperous in the future as it had been in the past. The working season had proved, as usual, that certain alterations and enlargements were needed in their plant, and these would be carried out during the current half year. No doubt, with attention, the company would be able to go on in the same satisfactory manner as hitherto. He would now propose that the report be adopted, merely adding that if any information or explanation were required, he should be happy to give it.

Mr. B. SAVAGE seconded the motion, which was adopted.

A dividend of 5 per cent., free of income-tax, for the half year was then declared, and the retiring directors and retiring auditor were re-elected.

Mr. R. WARNER moved a vote of thanks to the chairman and directors for their efficient services during the past half year.

Mr. SUTTON seconded the motion, which was carried.

The CHAIRMAN acknowledged the compliment, hoping that the shareholders would be enabled to accord the directors their confidence in the future as they had done for so many years past.

The meeting then separated.

THE CHELTENHAM WATER-WORKS COMPANY have presented their engineer and manager, Mr. Wm. M'Landsborough, with an honorarium of 100 guineas, in recognition of the valuable services rendered by him in the designing and construction of the new water-works at Tewkesbury, under the powers of their last Act of Parliament.

BRIGHTON GASLIGHT AND COKE COMPANY.

The Ordinary Half-Yearly Meeting of the Proprietors of this Company was held on Thursday, the 23rd ult., at the Office, 13, St. Swithin's Lane, London—HENRY WHEELER, Esq., in the chair.

The following report and statement of accounts for the half year ending the 30th of December, 1870, were submitted:—

An unusually full season at Brighton, caused chiefly by the war on the Continent, has increased the demand for gas during the latter portion of the past half year.

The period allowed by Lord Redesdale's Act for altering and stamping meters expired on the 13th of October last. This operation has been productive of great expense to gas companies, though the mischief has been somewhat mitigated to this company by the prudent course which had been pursued in reference to meters for several years prior to the passing of the Act. The directors are now happy to state that the necessary alterations were effected in good time, and that not a single unstamped meter belonging to the company remained in use at the above date.

As the principal Brighton season commences with autumn, the second half of the year is usually the most productive of gas-rental. This circumstance, in addition to the favourable one previously alluded to, enables the directors, on the present occasion, to recommend the declaration of a dividend on the paid-up capital of the company of 5 per cent. for the half year ending the 25th of December last (less income-tax), the same to be payable on and after the 6th of March next.

Two of the directors, Mr. Weiss and Mr. Burder, and one of the auditors, Mr. Scarr, retire by rotation, but all are eligible for immediate re-election.

Dr. — *Profit and Loss Account, for Half Year ending December 25, 1870.* — *Cr.*

To Coals			£7,927	12	3	
Materials for purification			259	0	0	
Wages			1,490	1	5	
Rent, rates, and taxes			283	0	6	
Salaries, collectors commission, directors and auditors			1,084	2	7	
General charges			109	9	7	
Wear and tear			1,694	10	0	
Depreciation account			200	0	0	
Bad and doubtful debts and allowances			122	10	0	
Interest on debentures			300	0	0	
Balance			3,744	12	6	
			£17,214	18	10	

By Gas and meter rental			£14,279	3	1	
Coke, &c.			2,854	5	8	
Interest account			81	10	1	
			£17,214	18	10	

Dr. — *Balance-Sheet, December 25, 1870.* — *Cr.*

To Capital			£78,300	0	0	
Debentures			12,000	0	0	
Contingency-fund			4,620	12	6	
Depreciation account			1,982	19	11	
Coal insurance account			994	19	11	
Dividends unpaid			926	18	7	
Interest on debentures			161	4	2	
Tradesmen's accounts, &c., owing			1,361	0	4	
Profit and loss balance—						
From last half year	£431	0	2			
As above	3,744	12	6			
			4,175	12	8	
			£104,523	8	1	

By Expended on works			£81,421	10	1	
Meters			2,192	17	5	
Works in progress			1,171	17	2	
Coal, coke, &c., in stock			2,589	11	4	
Mains, service-pipes, and general stores in stock			915	0	0	
Sundry debtors for gas			10,436	1	5	
Ditto for coke, &c.			1,436	7	10	
Cash at bankers, in hand, and on deposit			4,360	2	10	
			£104,523	8	1	

The report of the directors was received and approved, and a dividend for the half year ending the 25th of December last, of 5 per cent. on the paid-up capital of the company, was declared, free of income-tax, payable on Monday, the 6th of March, and three following days. The retiring directors and auditor were re-elected, and thanks were given to the directors and auditors for their attention to the affairs of the company, and to Mr. Rutter, the manager, Mr. Weare, the secretary, and the other officers, for the able manner in which they had discharged their respective duties.

BOLTON GAS COMPANY.

The Half-Yearly Meeting of the Bolton Gas Company was held in the Board-Room, Hotel Street, on Wednesday, Feb. 22. Mr. THOMAS MOSCROP, chairman of the company, presided.

Dr. — *Capital Account, June 30 to December 31, 1870.* — *Cr.*

June 30.—Amount expended on the company's works to this date					£173,518	12	6
Dec. 31.—Ditto expended this half year, viz.:—							
Mains		£1,611	14	8			
Meters		708	3	0			
Apparatus		321	0	0			
Gasholder		4,375	0	0			
Tank		426	19	11			
Land and buildings		400	0	0			
		7,842	17	7			
Cr. by sales of old metal		36	0	0			
					7,806	17	7
					181,325	10	1
Balance carried down					13,952	4	10
					£195,277	14	11

June 30.—Capital at this date, viz.:—						
10 per cent. stock—						
3999 shares of £16 10s. each, all paid up			£64,498	10	0	
6½ per cent. stock—						
7466 shares of £16 10s. each, £14 10s. per share paid up			108,257	0	0	
			£172,755	10	0	
Dec. 31.—Call of £1 per share on 7466 new shares			7,466	0	0	
Reserved fund investment			15,056	4	11	
			£195,277	14	11	
Balance brought down			£13,952	4	10	

Dr. — *Revenue Account, for the Half Year ending December 31, 1870.* — *Cr.*

To Cannel and coal consumed					£10,834	15	7
Wages for gas manufacture					1,777	17	11
Lime and purifying					454	8	4
Retorts, materials, and labour					319	3	2
Repairs of iron and brickwork—							
Wages		£1,696	17	0			
Materials		2,389	0	9			
					4,085	17	9
Water					58	14	10
General expenses					91	10	7
Directors remuneration					100	0	0
Salaries					1,264	13	5
Rates and taxes					983	7	1
Chief rents					95	13	1
Office expenses, stationery, and printing					171	18	1
Law charges					109	14	0
Meters, fittings, and repairs—							
Wages		£863	15	1			
Materials		2,562	5	2			
					3,426	0	3
Bad and doubtful debts					144	0	3
Bank interest and commission					98	5	0
					24,015	19	4
Balance transferred to dividend account					6,912	11	6
					£30,928	10	10

By Half year's gas-rental—						
Gross			£25,866	4	1	
Less discounts			2,762	7	0	
			£23,103	17	1	
Meters and fittings			4,193	16	9	
Meter-rents			89	5	10	
Coke			1,569	11	4	
Tar			820	2	8	
Spent lime			94	9	4	
Ammoniacal salts and liquor, net proceeds			919	18	9	
Rents			96	16	5	
Sundries			18	3	6	
Interest on calls in arrear			22	9	2	
			£30,928	10	10	

Mr. WATKINS, the law clerk of the company, having read the circular convening the meeting, the following report was taken as read:—

The directors submit to the shareholders the annexed statement of accounts duly audited and verified for the half year ending the 31st of December, 1870. The expenditure on capital account during the half year has been £7806 17s. 7d., chiefly on the additional new gasholder in Spa Fields, and in the extension of mains. This expenditure rendered necessary a further call of £1 per share on the uncalled-up share capital, payable on the 31st of December last. The expenditure under the item "Repairs of iron and brickwork" in the revenue account, has considerably exceeded the average. The increased income has, however, not only provided for this outlay, and for the payment of current dividends, but has left a balance amounting to £169 6s., which sum is added to the reserve-fund. The dividend will be as follows:—

5 per cent. on £64,498 10s.	£3224	18	6
3¼ per cent. on £108,257	3518	7	0
Total	£6743	5	6

The CHAIRMAN, in rising to move the adoption of the report, said that this being what might be termed the half-yearly meeting, it was not his intention to detain the shareholders by entering into minute details as regarded the balance-sheet. He might, however, observe, that a review of the transactions of the company for the last six months gave unmistakeable evidence of its continued success and prosperity. The shareholders would have observed, no doubt, that the total expenditure of the last six months amounted to £24,015 19s. 4d., as against £20,680 7s. 5d., an increase in the corresponding period of last year of £3335 11s. 11d., as shown in the revenue-account. The item, "Repairs of iron and brickwork," was certainly unusually large, the fact being that many of the retorts had to be thoroughly renewed, and some time ago there were two old gasholders comparatively useless, and were now dispensed with. It was only thought fit and equitable that, in order to keep the capital account intact, they should charge that expenditure to revenue account as an equivalent of what, to some extent, might have been charged for the replacement of those gasholders. The fact now referred to, with two or three trifling additions, would account for the large increase in the expenditure. On turning to the credit side, he found that the increase on the gas-rental, comparing it with the corresponding period of last year, amounted to 12¼ per cent., representing £2521 5s. 7d. The quantity of gas made this last half year was 156,487,000 cubic feet, as against 140,384,000 cubic feet in the corresponding period last year, or an increase of 16,113,000 cubic feet. The income for the last half year amounted to the sum of £30,928 10s. 10d., as against £27,315 3s. 2d. in the corresponding period of last year, or an increase of £3613 7s. 8d. Although the increase in expenditure had been so large, the company had been enabled not only to meet their liabilities, but had also added to the reserve-fund the sum of £169 6s. Referring to matters in connexion with the Bolton Corporation, the chairman proceeded to say that he did not know whether it was worth while to notice a fact or two in connexion with one or two questions which had cropped up in the corporation having reference to the Bolton Gas Company. He ventured to say that some of the shareholders would remember having seen in the report of one of the meetings of the Town Council an observation made by the chairman of the Lighting Committee, that there had been many complaints from the public on account of the bad lights of the street-lamps. That gentleman had further stated that this certainly was not the fault of the corporation, for they were not allowed to touch the taps, and therefore it must be the fault of the gas company. It was further asserted that the corporation had more lamps in Bolton than any other town having a similar population. He (the chairman) wished to observe that had it been a question purely as to the number of lamps, and not as to the quantity of light, there would have

been some force in the remarks of the chairman of the Lighting Committee. That gentleman named eight towns of similar size having a less number of lamps; but from inquiry he (the chairman) found that the quantity of gas consumed—the number of feet per hour per lamp—in those several towns was greater than that of Bolton; in fact, that comparing those towns with this town, Bolton stood at the very bottom of the list. These several towns vary from 24 per cent. to 69 per cent. over the quantity of gas used by the corporation in the interests of the public of Bolton. Further, from inquiries made from 26 other towns, he found that the increased quantity of gas used by those towns for the lighting of their street-lamps amounted to from 31 to 106 per cent. more cubic feet for each lamp, than was offered by the corporation to the street-lamps of Bolton. He might state further that the gas company were favoured with two interviews by a deputation of the corporation, headed by the mayor; and, so far as he (the chairman) observed, the discussion was carried on with candour and in a friendly spirit; and, though nothing very definitive resulted from that discussion, he would here affirm, as his deliberate opinion, that if the Bolton Corporation could see their way clear to giving to each lamp as much gas as the average quantity allowed by other towns, and if they would abandon their present unscientific system of fittings, by the discontinuance of check-taps and by the adoption of regulators, as now used in the metropolis, Birmingham, Nottingham, and several other large towns, they would at once, by applying the remedy, effect a cure of those defective lights in the street-lamps. There were also a few remarks made at the council meeting, to which he had already referred, by Alderman Ferguson. Of course, Alderman Ferguson was a professional man, and delivering, as he did, a gratuitous deliberate speech in the public assembly of the Town Council, deference would be paid to his opinion. The words of Alderman Ferguson used on that occasion ran thus: "He (Alderman Ferguson) had also to find fault with another quality in the gas. He had not subjected the gas to experiment beyond that of breathing it, but within the last few months he had had a strong impression that there had been an excess of carbonic oxide in it that gave no light, but escaped into the atmosphere, and was most injurious to health. It was this carbonic oxide that gave rise to the suffocating feeling we had in going into a confined room where there was gas burning, but not sufficient ventilation." Of course, he (the chairman) would speak with all diffidence in replying to the alderman; but, assuming that his pathological knowledge and diagnosis of the diseases "flesh is heir to" was what it ought to be, he could not but think that, from Alderman Ferguson's own showing, his knowledge of chemistry, in its application to the manufacture of gas and gas lighting, was capable of improvement and extension. The gist of Alderman Ferguson's remarks lay in this, that this carbonic oxide gas would not light, but escaped into the atmosphere. Now he held it as a well-known fact, and he would refer to Professor Miller, Professor Wilson, Dr. Letheby, Dr. Odling, Professor Frankland, Professor Fownes, and the last edition of the "Encyclopædia Britannica," for proof of the statement, that while carbonic oxide was undoubtedly a constituent of all cannel or coal gas, it did not escape into the atmosphere as it entered the lighted burner. It was an indisputable scientific truth that carbonic oxide was an inflammable gas, and as it entered the lighted gas-burner it necessarily underwent the process of combustion, so becoming oxidized; it was no longer carbonic *oxide*, but carbonic *acid* gas—a gas identical with that which was the result of combustion from any oil lamp or taper, or wax or sperm candle. In fact, it was a gas identical with that which was being breathed out from the lungs of their censorious critic, when he was imposing on his audience that scientific fallacy. But, further, disparaging remarks had also been made as to the quality of their gas made within the last three years. He held in his hand a paper in which was recorded monthly the illuminating power of the Bolton gas for the last twelve years, taken by their analytical chemist, Mr. Watson—and he might observe that in not a single instance had it failed in the parliamentary test, as regarded its chemical purity—and during the last three years its illuminating power was not only equal, but had actually been higher than during any other three years out of the whole of the twelve years to which he had referred. Reverting to another subject, the chairman proceeded to say that some remarks were made a short time ago by our excellent mayor, about the manner in which the streets were disturbed, and he had suggested the propriety of the gas company and the corporation conferring together previous to the taking up of streets and the repaving of them. He was sure that the board of directors of the gas company entirely coincided in the wisdom of such a procedure, and would be most happy to meet the corporation, and avoid the possibility of needlessly disturbing any of the public streets of Bolton. But the directors and shareholders of the gas company could not forget that there was something peculiar about the exigencies and contingencies of the gas company which no forethought could possibly avoid. For instance, in a large company like theirs, the joints of any of the main-pipes might at any time be drawn by the subsidence of the earth, and also by severe frosts. And not only were those joints liable to be drawn, but the pipes themselves also occasionally cracked from similar causes; and they might be sure that in a very short time an immense loss of gas would ensue. Not only so, but it jeopardized alike the lives and property of those in the immediate vicinity. Now, Parliament, in the interests of public safety, had introduced a penal clause into the Gas Companies Clauses Act, to the effect that after certain notice had been given of the escape of gas, it was at the peril of all gas companies if they did not at once attend to that notice—they were liable to a very heavy penalty. The shareholders and the public would see that these were exceptional cases, when they could not act upon the principle suggested. In conclusion, he moved the adoption of the report and balance-sheet.

Mr. J. Brooks wished for the sake of information to the shareholders to ask two questions. On the credit side of the proof balances, Dec. 31st, 1870, he found that the amount owing to the company was £23,716 8s. 2d.; but in the previous half year it was £10,669 9s. 10d. He wished to know in what way this large amount was owing, and how it came to pass that that amount had accumulated to such an enormous sum in the course of six months.

The Chairman said it was very easy to explain that matter. In the June quarter, during the long days, little gas was consumed; but the December quarter was a very heavy quarter, and the company had to take stock of the amount of gas, &c., owing for at a particular day, in order to make up their accounts. It certainly looked as though there was a very wide difference betwixt the amount owing to the company in the present half year, when compared with the previous half year; but if Mr. Brooks happened to have the balance-sheet for the corresponding period of last year, he would there find a corroboration of his (the chairman's) remarks. Though the gas company's accounts had increased, and also the number of consumers been augmented by 1000, or 6½ per cent., yet the amount owing now was only £23,716, as compared with £22,241 13s. 8d. owing at the corresponding period in last year.

Mr. Brooks: That brings out another question. Is that sum entirely owing on gas-rents?

The Chairman; I may say it is. There may be some fractional amount for other things, but nothing of any moment.

Mr. Wolfenden seconded the adoption of the report and balance-sheet, and in doing so stated that the accounts of the company had been verified by a gentleman of known reputation—Mr. Kevan—and they had also been indirectly verified by Mr. Williamson, the borough treasurer, in the interest of the public.

Mr. Brooks: I did not think there was anything wrong with the figures.

Mr. Wolfenden thought that Mr. Brooks was perfectly right in inquiring, because the more shareholders inquired the better they would be satisfied.

The Chairman said with regard to the questions of Mr. Brooks he was much obliged to him for putting them.

The report and balance-sheet were then agreed to.

The Chairman then moved—"That a dividend be and the same is hereby declared of £10 per cent. per annum on the old shares, and £6 10s. per cent. per annum on the paid-up capital of the new shares, and that the same be paid forthwith, free of income-tax."

Mr. Green seconded the resolution, which was adopted.

Mr. Brooks moved, and Mr. Morris seconded, a vote of thanks to the chairman, which was carried and acknowledged.

HASTINGS AND ST. LEONARDS GAS COMPANY.

A Meeting of the Shareholders of this Company was held at the Gas-Works on Thursday, March 2—R. Deudney, Esq., in the chair.

The Secretary (Mr. W. B. Young) read the notice convening the meeting, and the following report of the directors was taken as read:—

The No. 2 gasholder, mentioned in the last report, is now finished, and found to work most satisfactorily. The cost of the entire repairs and additions is £356 10s. 9d.; and your directors, being anxious to keep the suspense account as low as possible, have charged £100 of this expense to the half year's profit.

Notwithstanding this item, your directors have pleasure in referring you to the accounts herewith handed, which leave a balance (with the £39 11s. 4d. left over from last year) of £2781 7s. 7d., to be dealt with by the shareholders.

It is therefore recommended that a dividend of 8 per cent. be paid on the old shares, and 7 per cent. on the new shares, amounting to £2700; that £50 be carried to the credit of the suspense account; and that the remaining balance of £31 7s. 7d. be carried on to the next half year.

In the financial statement appended to the report, the working account showed that the receipts for gas, coke, fittings, &c., amounted to £13,692 19s. 1d., and that the stock in hand amounted £14,785 7s. 2d., the total amount on the credit side being £28,609 18s. 1d. The disbursements were of the usual character—£4885 11s. 5d. having been paid for coal, £2547 15s. 10d. in wages and salaries, and £1352 15s. 8d. for stock, the balance in favour of the company being £2741 16s. 3d. The account of liabilities and assets showed an available balance of £2781 7s. 7d.

The Chairman said it was fortunate for him that the directors came before the shareholders with a rather favourable report—at any rate, it was quite as favourable as the low price of gas would allow. It was very fortunate for the shareholders that the repairs and additions to the No. 2 gasholder were extended in time to prevent an occurrence similar to what had happened at another place, for had it not been so they would probably have been involved in an expense of some thousands of pounds. They would see by the report that the repairs and additions to the holder had cost £356. The work had been done entirely by their own men. Having recommended it, he had taken great interest in it as it progressed, and he believed that had it not been carried out by their own people the cost would have been double. The work had been successfully carried out, and he believed that nothing could be more satisfactory. The receipts had been so favourable that they had paid off £100 of the expense of the tank, and carried forward the remaining £256. He thought the shareholders would see that the directors had acted wisely. There was a choice of two evils. One was to reduce the dividend and pay off the expense immediately, and the other to keep up the dividend and pay it off in the course of a few years. When they considered how shares were going, they considered it their duty to offer the same amount of dividend. There was a slight additional capital, which they would see had been expended upon new main services and lamps, for roads were being laid out on the Clive Vale Estate and at St. James's Terrace. The total cost was £342 8s. 4d., and the whole of that was entered to the capital account. He thought that in time they would derive considerable advantage from that expenditure. A very important point in connexion with the supply of coal had received the serious attention of the directors. Last summer they found considerable difficulty in getting coal from Whitstable, and they therefore thought it their duty to obtain trucks of their own. That had been done, and he believed it would prove a great advantage. The trucks were hired at a certain number of years at an annual charge, and then they were to become the absolute property of the company. Last year they were driven to extremities, the large quantity of hops and other merchandise conveyed on the South-Eastern Railway interfering with the carriage of coal; but now they had obtained the trucks they would have no difficulty in getting a constant supply as the vessels arrived. He believed that last year vessels remained loaded for upwards of a month because the trucks could not be obtained. He thought the accounts for the last half year would be found rather more satisfactory than had been anticipated. As he had said, the price of gas was low, but there was a prospect of a considerable increase of consumption, and he had no doubt that in the course of a short time they would be able to give a still better dividend. He did not think there was any probability of their having to expend any more capital except for new mains, and he could not but believe that they were ready to do nearly double the work they were now accomplishing. He thought they should be very thankful that the repairs of the tank had been carried out. He moved—"That the report be received and adopted."

At the request of the chairman,

Mr. A. H. Wood, the manager, read a paragraph from the *Daily Telegraph*, giving an account of an alarming accident that had taken place at the works of the Chartered Gas Company. It stated that one of the four enormous gasholders had risen as high as it could upon the columns supporting it, when, apparently from its being over filled, the supports or columns gave way, and the gasholder tilted over, which had the effect of letting the gas escape. The volume of gas came in contact with a blacksmith's fire, and the result was a terrific explosion, the damage amounting to several thousand pounds. Portions of the gasholder were doubled up like a roll of carpet, and the massive pillars were broken down. Mr. Wood explained that it was just such an occurrence as he had feared would happen with No. 2 gasholder, which he found to be oscillating to the extent of 3 inches or 4 inches in January of last year. He had read of three or four gasholders going over from similar causes. He was sure the shareholders would consider it was prudent to have No. 2 holder put in a perfect condition. It would be very proper to spread the expense over four or five half years, because future shareholders would have the benefit of the repairs. But the past half year had been so far successful that the directors thought £100 could be paid off, and the remainder might be spread over two or three succeeding half years.

Mr. John Reeves seconded the motion for the adoption of the report, and it was carried unanimously.

The Rev. J. H. Hatchard asked whether it was in contemplation to make use of the pier for landing coals, and whether in that case the price of coals would be reduced?

The Chairman said the subject had not been under the consideration of the directors. They had entered into contracts for obtaining coal from Whitstable for the next two years.

Mr. Wood said they had always found a difficulty in carting the coal from the sea-shore. It had to be brought to the works in small carts, and the expense became very heavy. That was one reason why they sent to Whitstable, and he was afraid that objection would still exist if coals were landed at the pier.

Mr. Young explained that coals were obtained much cheaper by land from Whitstable than they could be brought by sea.

Mr. George Scrivens alluded to an article which had appeared on the previous day respecting the landing of steamers at Brighton. It had at times been found utterly impossible for passenger steamers to lay alongside the Brighton pier, and that was the reason why the passenger traffic across the Channel went through Newhaven. If steamers could not lay alongside for landing passengers, he thought it would be impossible for coal vessels to discharge their cargoes there.

[It appears from a statement in a local paper that the Act of Parliament under which the pleasure pier is being constructed provides that "no merchandise or goods (passengers personal luggage excepted) shall be landed on or at the said pier."]

A resolution for printing the names and addresses of the directors and officers of the company in the half-yearly reports was then adopted, and the proceedings closed with a vote of thanks to the chairman and the members of the board.

METROPOLIS GAS SUPPLY.

Metropolitan Board of Works.

At the Weekly Meeting of the Board, held at the Offices, Spring Gardens, on Friday, March 10—Colonel Hogg, M.P., in the chair,

Mr. Dresser Rogers, in accordance with notice given, moved a series of instructions to the Parliamentary Committee to endeavour, if possible, to obtain the insertion of certain clauses in any new gas bills introduced into the Houses of Parliament, during the present session, for supplying any portion of the metropolis with gas. In doing so, he said he had been influenced, in the first place, by the fact that the Government had given notice of their intention to introduce a bill to alter the conditions affecting the supply of gas in those parts of the metropolis which were not under the regulations of the City of London Gas Act, 1868. The object he had in view was simply a reference of certain points to the Parliamentary Committee for their consideration, and not in the slightest degree to dictate to them what course they should adopt in regard to this important question. The first instruction he proposed that the board should give the committee was to endeavour to obtain in such bill a proviso "that the testing-burner to be used for the purpose of testing the gas for illuminating power shall be as nearly as possible like those in most general use by the consumers of gas, and that for that purpose a bat's-wing burner of an exact stated size and form be adopted (the pressure being regulated to the parliamentary standard), or one which will properly and fairly carry out the intention of the Legislature." It was not necessary to dilate largely on this point. Almost all the members of the board, having from circumstances been obliged to make themselves, to a certain extent, acquainted with the gas supply, knew that for the last ten or fifteen years the question of the test-burner had been a source of great dissatisfaction. The burner in use under the Metropolis Gas Act, 1860, was Dr. Letheby's old Argand burner, which considerably exaggerated the illuminating power of the gas submitted to it, and the new burner employed under the Act of 1868 was the one known as "Sugg's burner," which possessed a similar quality. Now, the consumers of gas naturally thought that the burner employed for the purpose of testing gas should be such an one as they themselves could use in the ordinary way in their own houses, and he (Mr. Rogers) did not see any difficulty in the way of that course being adopted. He had proposed in his instruction that the burner should be of the description known as a "bat's-wing," but he was willing to admit that probably such a burner would not be appropriate for the purpose, and he would leave it to the committee to suggest what would be the best. All he desired was that a practicable burner for the consumers should be employed for testing. The second instruction was, "that in all cases the gas to be tested by the official gas examiners shall be supplied and taken from an ordinary distributing main, and not from an otherwise untapped main." The meaning of this was that the gas should be taken from the same main as that which conveyed the gas to the consumers, which at present was not always the case. It appeared to him that to test the gas delivered from a main direct from the works, which main did not supply the consumers themselves, was liable to create a feeling that there was some unfairness being practised, although he was not inclined, and must not be supposed to wish to insinuate anything prejudicial to the integrity of the gas companies adopting that course. The third instruction was to insert a clause to the following effect:—"That if, in taking the testings during the prescribed hours, any one testing shall fall below the parliamentary minimum, such testing shall not be allowed in the calculation of the average power when taken." He thought it was extremely unfair to the consumers that the gas testers should take the average of three testings at three different hours, whatever they might be, as the proof of the illuminating power, because the two first tests might show the gas to be considerably below the minimum, and the third considerably in excess of it. In proposing that these provisions be inserted in the Government bill, it seemed to him that the companies themselves should be willing and desirous to acquiesce. There were other clauses which those who were interested in the matter might desire to see introduced, but this was as far as he intended to interfere with the proposed general gas legislation. With reference to the bill promoted by the Chartered Gas Company, and which the board had agreed to petition against, he proposed that their opposition should include opposition to certain clauses.—1. "The proposal to employ the capital of the company in making a railway for general passenger or goods traffic." In the early clauses of their bill the company proposed to construct a short line of railway to connect their works at Beckton with the Great Eastern Railway system, and then they proceeded to insert the ordinary clauses of a railway bill to enable them to levy tolls and carry passengers and merchandise. He thought the board would consider it worthy of attention whether it was desirable that capital raised for the purpose of manufacturing gas, and upon which capital a parliamentary interest was to be paid, should be employed in the construction of a railway for general goods and passenger traffic. He, of course, would have no objection to the company making a railway for the conveyance of coals, or of their own workpeople, or for any other object connected with the carrying on of their legitimate undertaking, but when they went beyond that he was of opinion they ought to be restrained. His second ground of opposition was to clause 37 of the bill, by which the capital of the Equitable Company is assumed, unless such capital is verified. By the bill it was proposed to effect an amalgamation of the Equitable Company with the Chartered Company, and by this clause it was assumed that the capital of the former was £300,000. Inasmuch as thereafter this capital would be entitled to a preference dividend of 10 per cent, it became a matter of considerable importance to the consumers that this capital should be verified in the proper way. His third ground of opposition was to the clauses beginning with clause 45, because the proposed compensations were different to the scale approved by the Board of Trade in former amalgamations. He desired only that the committee should look into this matter, and see if there was anything unfair in the contemplated arrangement. To him it appeared that the same scale as that already sanctioned should be adopted, unless good reason was shown to the contrary. He desired, in the fourth place, that opposition should be directed to clause 54, which extended the power of amalgamation to all the metropolitan gas companies, because, in this clause, no provision was made for the reduction of unproductive capital. Looking at the subject from one point of view, a great deal might be said in favour of amalgamations, but then they ought not to be effected in such a way as to make the unproductive capitals of the companies a permanent charge upon the consumers. He might instance the case of the Phœnix Company. No doubt that company did their best to improve their works, but gas-making was not so well understood formerly as at present, and capital was expended then which did not fairly represent the amount now required for the supply of their district. He did not wish that those who had invested their money should lose the benefit of it, but he thought an arrangement should be come to by which the consumers might not be called upon for all futurity to pay 10 per cent. upon capital now wholly unproductive.

Mr. Harris said the Phœnix Company were limited to 7½ per cent. upon their capitalized stock.

Mr. Rogers said he was not referring to new stock; he was speaking of money raised in times past for gas-making purposes, which, in the present state of science, was not required; and he contended that for such capital it would not be fair to make a perpetual charge of 10 per cent. upon the consumers. In the fifth place, he desired that the board should oppose clauses 56 and 57 of the bill in order to protect the gas examiners. By clause 56 it was provided that "the gas company may examine into the condition of the testing apparatus at every place where its gas is to be tested once in each week." At the present time the company had full power and authority to be present whenever the testings took place, and when the referees examined the testing apparatus, and therefore he considered this clause should be expunged altogether. By clause 57 it was enacted that the referees should twice a month examine the testing apparatus, and, in case of its being defective, the testings at that place should be discontinued until it was repaired. He only desired to call the attention of the committee to this clause, that they might look into it and judge of its propriety. Sixth, he objected to clause 58, because this seemed to interfere with the board's control over the testing-places. He did not understand the meaning of this clause. It provided that every testing under the Act of 1868, whether for illuminating power or purity, should be conducted and completed by the appointed gas examiner at the testing-place belonging to the company and prescribed for the station at which the gas tested is manufactured, and at none other. The testing-places at present were the property of the board, and they only had control over them. Why should they be made the property of the company? They ought to remain in possession of the board. In the seventh place, he proposed that the opposition of the board should be directed against clauses 59, 60, and 61, because they most materially interfered with the gas legislation of 1868, and with the present action of the board through its officers, by which the consumers were protected. These clauses involved technical questions which could not then be gone into, but he thought the gas examiners of the board would state that they would materially interfere with their duties. By the 59th clause it was enacted that the gas should be tested daily for illuminating power, and at the times appointed by the referees, for purity, and that in the event of the same being defective in either particular the examiner must, within an hour, give a written notice thereof to the superintendent of the station at which the gas was manufactured. Practically speaking this was perfectly impossible. By the 60th clause it was enacted that the testings for six successive days should be deemed to represent the illuminating power of the gas for one week. It would take some time to explain the exact operation of this clause, but he was quite sure it would work most unfairly. During five days the company's gas might be very inferior, and on the sixth, by means known to themselves, it might be so improved as to come within the terms of the Act. Under these circumstances he hoped the board would agree in the instruction to the committee to direct their opposition to all these clauses. He further proposed that the committee be instructed to endeavour to obtain the insertion of clauses in the Chartered Company's bill—1. "To provide for the sale, disuse, and removal of the works of the Equitable Company at Vauxhall, and for the reduction of the capital of the amalgamated company by the result of the sale of same."—2. "That the testing-place for the gas shall be within the area of the immediate supply." Under the clauses of their present Act, they were bound, within a certain time after the completion of the new works at Beckton, to remove the manufacture of gas from their present stations in the metropolis, and under the provisions of their amalgamation scheme with the City Gas Company they were required, within a certain time, to cease the manufacture of gas at Blackfriars. All he asked by the first proposed clause now was, that a similar obligation should be laid upon the company in the event of the amalgamation of the Equitable Company. By the second clause he desired to protect the consumers from being prejudiced by the gas supplied to them being made at works beyond their respective districts. Unless such a provision were made, considerable difficulty might arise in some cases.

Mr. White said he would second the motion if Mr. Rogers agreed to substitute the word "recommended" for "instructed."

Mr. Rogers agreed.

Mr. Newton said he did not believe this motion would have been put on the notice paper if Mr. Rogers had known what action the Parliamentary Committee had taken in the matter. Everything had already been done by them which, in their judgment, it was desirable to do. Some of the proposals of Mr. Rogers it was not at all desirable to entertain—for instance, the first proposition, in which he asked that the burner to be employed for testing gas should be a burner of the description in general use at the present time. Indeed, he might say it was an impossibility. The City of London Gas Act had settled the point, for it indicated a specific burner for the purpose; and, in consequence of its prescribing that burner, it increased the illuminating power of the gas to be supplied from 12 to 16 candles. Having done that, the board could not ask to go back to the old burner, because the effect would be to require the gas to be raised from 16 to 20 candles. Having fixed a high illuminating power, as tested by a certain burner, it would be unfair to ask that an old burner, which would not develop the quality of the gas, should now be employed. There would be very great danger in attempting to unsettle recent legislation on this point, which would be the case if the committee were instructed to go to Parliament with such a proposal. There were also other parts of the "instructions" which were equally objectionable, but which he need not refer to. He could assure the honourable member that the committee had already taken the whole question into consideration, and had embodied in their petition everything which they deemed objectionable in the Chartered Company's bill. With reference to the railway which the company proposed to construct, the committee submitted to Parliament that a company incorporated to supply gas ought not to be permitted to spend any portion of their capital in the construction of a railway. It was true that the estimated amount for that purpose was only about £21,000, and this allegation being in the petition, it would give the board the opportunity of hearing what the company had to say in support of the proposal. If it should turn out that the railway would facilitate the production of gas at a more economical rate, the board would scarcely be justified in opposing it. With regard to the other provisions in the Chartered Gas Company's bill, the petition prepared by the board in opposition stated that the clauses by which the mode of testing gas was proposed to be altered would be detrimental to the interest of the gas consumers, and even if such clauses would not prejudicially affect the consumers, the petition submitted that the alteration of the present law should be effected, not by means of a private bill, but by some general enactment. Under these circumstances, the motion now made was unnecessary—first, because the committee had anticipated all that Mr. Rogers proposed to instruct them to do; and, secondly, because if they had not already embodied these matters in their petition they would be now too late, as, with reference to petitions not already in the House, the board would have no *locus standi*. He (Mr. Newton) would, therefore, move "the previous question," because he was not disposed to vote against the statements in the motion, of the necessity for alterations being made in the company's bill. The principle of many of those alterations had been so often before the board, and decided upon, that it was perfectly needless to instruct the committee to insist upon them; and with regard to the Government bill, it was only needful to say that as yet it was not before Parliament, and it would be a far more prudent course to wait until its provisions were known, and could be submitted to a crucial examination, than to commit

the board at the present moment to a course of action which might impair their future proceedings.

Mr. Elt seconded the amendment.

Mr. Richardson said he hoped that a provision would be inserted in the bill restraining the company from paying 10 per cent. on new capital expended in unproductive districts. They ought to be required to borrow the money on the best terms they could obtain it for in the market, and be allowed only 5 per cent. upon it.

Mr. Brushfield said such a suggestion was manifestly unfair, because every company in the metropolis was bound to lay mains all over its district, whether they would be productive or not. It would be impossible to make a distinction between capital so expended, and to distinguish which part was profitable and which was not. In some places a mile of main would produce ten or twenty times the rental of the same length in another; but, whatever might be the return, the companies were bound by Act of Parliament to lay mains in every part of their districts. With regard to the motion, he thought the statement made by Mr. Newton ought to satisfy the board that it was altogether unnecessary and uncalled for, because the Parliamentary Committee had already done all in their power to meet his views. Mr. Rogers spoke about the test-burner, and said the one now in use was not a proper burner. But this question had been deliberately settled by Parliament. The burner to be employed for the purpose had been defined, and Mr. Rogers, if he knew anything at all about the matter, would have known that whatever the merits or demerits of the present burner, a bat's-wing was not the proper substitute for it. As to taking the gas for testing "from an ordinary distributing main, and not from an otherwise untapped main," he confessed himself at a loss to understand the insinuation made by Mr. Rogers. He could tell that gentleman, on the best authority, that there was no such case in London as gas being taken from other than the ordinary main supplying the consumers generally. He (Mr. Brushfield) had not the slightest objection to all the points raised by Mr. Rogers going to the committee, although he thought the motion quite unnecessary, and that it never would have been made if Mr. Rogers had taken the trouble to acquaint himself with the proceedings of the Parliamentary Committee.

Mr. H. L. Taylor said if the construction put by Mr. Rogers upon the Chartered Gas Company's proposal to construct a railway were correct, there was something very unsatisfactory in it; but the statement made by Mr. Newton seemed to dispose of the supposition that the company intended it for general passenger and goods traffic. If the company sought only to facilitate its operations in the manufacture of gas, or the transit of coal and coke, the construction of a railway was perfectly legitimate; but if it proposed to use it for general purposes, it was most objectionable, and the attention of the Parliamentary Committee might well be directed to the subject.

Mr. Hows entered a protest against the business paper being encumbered with a long notice of motion by the honourable member, for the sake of making a speech. If Mr. Rogers had taken the trouble to inquire, he would have found that all which he proposed to instruct the committee to do had been already done, and the members of the board would have been spared the trouble of reading the terms of a motion which must come to nothing.

Mr. Rogers, in reply, said he did not belong to the Parliamentary Committee, and had not the honour to enjoy the confidence of the chairman of that committee, or perhaps he might have been as well informed as some members of the board thought he ought to be on this subject. He might state, however, that when he asked what were the terms of the petition presented by the board against the Chartered Gas Bill, he was informed it was merely a petition to obtain a *locus standi*. It was not till he heard the speech just made by Mr. Newton that he knew anything of the contents of the petition. He felt, in putting the notice of motion on the paper, that something ought to be done in the matter, and he was now glad to find that the attention of the committee had been directed to some of the points which had attracted his attention. But the committee had not touched the proposed legislation by the Government with regard to the rearrangement of the conditions of gas supply in the metropolis, and this certainly was a subject which would require to be watched over. With regard to the test-burner now in use, Mr. Brushfield spoke as though he (Mr. Rogers) had imputed wrong motives to the companies. He had never charged them with doing wrong in the matter, he merely asserted that the burner itself was an unsatisfactory one for the purpose. Mr. Newton said the companies were giving 16-candle gas, and the present test-burner made it equal to 18.

Mr. Newton said he had never made such a statement. What he said was that Parliament required the companies to give 16-candle gas, tested by a certain defined burner, and if the companies were now required to give 16-candle gas, tested by the old burner, they would have to supply it of an illuminating power equal to 20 candles. Parliament fixed the present standard of illuminating power having in view the burner now used for the purpose of testing, and it would be unfair to compel the companies to supply the same gas as tested by an inferior description of burner.

Mr. Rogers said the reasoning of the honourable member was very clever, but it did not affect the point of the argument. The committee of the House of Commons had no knowledge of the present test-burner at the time they fixed the illuminating power. It was invented by Mr. Sugg afterwards, and it made the gas appear two candles better than it really was. The Act of Parliament said the burner to be used for testing the gas should be such a burner as was practicable for use by the consumers of gas, but the burner actually used for testing was one which could not be used in the ordinary way in a shop or room. He had seen it tried, and knew that it was of too delicate a character for the purpose. Such being the case, it was not a fair burner for testing, and he maintained that the committee of the House of Commons, in fixing the illuminating power of the gas to be supplied, had not this burner in view, because it was not in existence at the time. On a former occasion, when Parliament fixed the standard at 12 candles, Mr. Sugg went to work, and constructed a burner which made the gas appear two candles higher than it was as tested at the consumer's burner, and now that science had demonstrated the feasibility of supplying 16-candle gas, Mr. Sugg had invented an improved test-burner which made it equal to 18 candles. With reference to the action of the Parliamentary Committee of the board, he had no wish to rob them of the honour of having taken action in reference to the bill of the Chartered Company, but he protested against a practice which was growing up of that committee coming to a determination amongst themselves to present petitions to Parliament, in the name of the board, without giving the members generally an opportunity of knowing the contents of such petitions. It had been done so in two instances.

Mr. Freeman rose to order, and objected to charges being brought against the committee to which no reply could be given.

The Chairman ruled that Mr. Rogers must confine himself to a reply.

Mr. Rogers said he was merely attempting to show that he had good grounds for making his proposals, because he was not aware that he had been forestalled in the matter by the committee. With reference to Mr. Brushfield's remark that no case existed in which the gas for testing had been taken from "an otherwise untapped main," he was prepared to say that the honourable member was entirely wrong. He knew that such a case had existed, and that was the reason why he proposed to insert a clause prohibiting the practice.

Mr. Harris said he presumed the case referred to was a solitary one.

Mr. Rogers said it was quite sufficient for his purpose that one case could be proved, and it would justify the interference of the board in the interest of the consumers to prevent its recurrence.

The amendment, "That the question be not now put," was carried, on a show of hands, by a majority of 11 to 9.

Mr. Rogers demanded a division, which was taken, when there appeared—

For the amendment	14
Against	12
Majority for	2

ALLEGED GAS NUISANCE AT DOVER.

At the usual Weekly Meeting of the Dover Local Board, held on Thursday, March 2—the Mayor in the chair—the following letter was read from the secretary of the gas company (Mr. G. Fielding), in answer to the complaint made last week by the town-clerk by order of the board:—

Dover, March 1, 1871.

Dear Sir,—I have laid before the directors of the Dover Gaslight Company your letter of the 24th ult., in which you say the local board have received a succession of very grave complaints of the insufferable nuisances which have lately recommenced with greater intensity than usual at the Buckland works. The company have recently spent large sums of money for the express purpose of preventing annoyance to the neighbourhood from their works, and only on the 14th ult. their engineer reported to them that their system was complete and effective. They are also informed that the officers of the local board are permitted at all times to have free access to the works. Your letter, therefore, caused the directors extreme surprise and concern. But being most desirous of meeting the wishes of the local board, they caused immediate inquiries to be made, and have failed to discover grounds to justify the serious charges you make against the works. They, therefore, direct me to ask you, in justice to the company, and to Messrs. Anderson and Jones (the gentlemen who are responsible for the management of the works), to give me full particulars of the instances to which the succession of complaints you have received allude, when they will cause a further full investigation to be made into the matter.

The Surveyor then read the following report he had drawn up upon the same question:—

Local Board Surveyor's Office, March 2, 1871.

To the Managing Committee.

Gentlemen,—In reference to the recent complaints as to the nuisance emanating from the gas-works at Buckland, I have to report that, in accordance with instructions, I have recently inspected those works, and find that the only new structure is that of a shed, in which is now kept the fresh lime and the metallic salts used for purification. The erection of this shed will not in any way add to the nuisance. With the exception of lime-burning, in addition to the manufacture of the gas, the only operation carried on is that of the manufacture of the sulphate of ammonia from what is termed ammoniacal liquor; this is done in the same manner as when Dr. Odling, the arbitrator in the late proceedings, made his inspection. This is a mode which with ordinary care cannot become a nuisance. Whatever nuisance there is must be sought for under the head "purifiers," and the correction of the ingredients used in and the general *modus operandi* of purification. The fearful nuisance which, previous to the late proceedings, occasionally pervaded the whole valley, is well remembered. This arose when changing purifiers. At that time the purifiers were charged with lime only, which upon being taken out and exposed to the atmosphere gave off sulphuretted hydrogen and other offensive odours. To obviate this the company adopted the new mode of purification, which consists of a metallic salt (oxide of iron), through which the crude gas, after certain preliminary treatment, passes, giving up its sulphuretted hydrogen. But there still remains another impurity (carbonic acid), for the removal of which lime is necessary. Slaked lime is, therefore, placed in the purifier as a final medium through which the gas has to pass on its way to the gasholder for use. Now, in theory, this state of things is almost perfection: the oxide or peroxide of iron seizes the sulphuretted hydrogen (the rotten-egg odour), water is formed, the metallic salt changes to sulphuret of iron, which upon exposure to the atmosphere undergoes a natural process of revivification by the formation of sulphur, thus enabling its being used over and over again until it becomes surcharged with sulphur. If the metallic salt and previous treatment have done their work thoroughly, there remains only carbonic acid converting the last layer of the purifier into carbonate of lime, which, of course, is in itself quite inoffensive. But now in practice, supposing the insufficiency in quantity or quality of the oxide or sulphuret of iron, then it resolves itself into an approach towards the old state of things. Under any circumstances, I believe it is found in practice that the lime on being changed is, to some extent, impregnated with those impurities, nearly all of which, from the use of metallic salts, theory expects the removal. Again, on the change of the purifiers, although care, I believe, is taken, previously to uncovering them, to blow atmospheric air through, more or less in quantity of unabsorbed and volatile matter must in the present exposed state of the purifiers find its way into the atmosphere, and be more or less offensive to the neighbourhood. How is this to be obviated? I believe in nothing short of closing in the purifiers during the time of change; the atmosphere to be allowed to pass inwards only, from sufficient apertures, to such enclosure, and the exhauster to be kept going for the purpose of drawing out from such enclosure the air and impurity, and driving them through a furnace up the shaft.—Your obedient servant,

John Hanvey.

The Mayor: That is not now done.

Mr. Hanvey: No, sir. Nor is it done anywhere. I have inspected the gas-works this week, and in justification of the managers, I must say that I saw nothing objectionable when I was there. I certainly did not see the purifiers changed.

Mr. E. P. Robinson moved that the further consideration of the subject be adjourned till next week.

Mr. Fry did not see why it should be put off. He had made inquiries, and found that it had not been smelt for two months previous, nor since the day in question. There must have been some little neglect on the day in question.

Mr. Robinson's motion was seconded and carried.

NEWCASTLE-UPON-TYNE GAS AND WATER.

The following are Mr. Pattinson's reports to the Newcastle-upon-Tyne Town Council on the quality of the gas and water supplied to Newcastle-upon-Tyne for the year 1870:—

Gas.

To C. F. Hammond, Esq., Chairman of the Gas Committee of the Newcastle-upon-Tyne Town Council.

Dear Sir,—I have the honour of presenting the following report, which gives in a tabulated form the results of my various testings of the gas supplied to this borough by the Newcastle and Gateshead Gas Company during the year 1870.

The gas has been tested, once in each week, at the office of the gas company in Neville Street, for its illuminating power, the amount of sulphur it contains, and to ascertain if it contains any sulphuretted hydrogen. I have supplied you from week to week with the results of these testings. The following table shows the maximum, minimum, and average illuminating power of the gas during each month of the year. The standard burner used in these testings has been the same as that in use when the Newcastle and Gateshead Gas Bill was passed, and which is described therein as an Argand 15-hole burner, with a 7-inch chimney.

Illuminating Power in Standard Sperm Candles.

	Maximum.	Minimum.	Average.
January	15·09	13·54	14·40
February	15·04	13·41	14·13
March	14·86	13·45	13·92
April	16·03	14·11	14·83
May	16·44	13·98	15·13
June	18·32	15·83	16·87
July	15·80	14·90	15·35
August	16·70	15·23	15·94
September	17·30	14·93	16·06
October	15·80	14·90	15·30
November	15·50	14·60	15·20
December	15·30	14·70	15·12

The illuminating power has been on seven occasions during the year below the required parliamentary standard of 14 candles.

It will be seen in the above table that there is a marked improvement in the illuminating power since April—the average before this month being barely equal to the illuminating power required by the Act, whilst the average since

April has been 15·62 candles. This improvement has been obtained in answer to your applications to the gas company, and to your representations that it was desirable to supply gas which should be better than that having merely the lowest illuminating power allowed by the Act of Parliament.

On no occasion has the gas been found to contain sulphuretted hydrogen.

The amount of sulphur existing in the gas in other forms than that of sulphuretted hydrogen, has been determined in the apparatus known as "Wright's," in which a jet of gas is burned in an atmosphere containing ammonia, and the products of combustion are condensed and collected by being passed through a Liebig's condenser. About 10 cubic feet of the gas to be tested was burned for each test.

The following table shows the maximum, minimum, and average amounts of sulphur contained in 100 cubic feet of gas during each month of the year:—

Grains of Sulphur in 100 *Cubic Feet of Gas.*

	Maximum.	Minimum.	Average.
January	7·68	6·48	7·04
February	7·19	6·53	6·87
March	8·69	6·55	7·69
April	15·08	7·81	10·09
May	27·94	8·00	15·37
June	8·34	7·78	8·10
July	9·68	7·22	8·97
August	11·05	7·50	9·22
September	9·00	6·59	8·04
October	6·46	5·28	6·03
November	8·40	5·66	6·69
December	6·85	6·33	6·6

On only two occasions during the year has the amount of sulphur exceeded that allowed by Act of Parliament, which is 17 grains per 100 cubic feet of gas. The average of the whole year has been 8·49 grains. When the exceptionally high amounts of sulphur were found, in April and May, the gas company were purifying the gas by a combination of what are known as the lime and the oxide of iron processes, whilst carbonizing the ordinary gas coal of the North Durham district. During the few weeks this combination was in use the amount of sulphur found in one testing was 27·94 grains, the average amount being 15·52 grains; whilst during the remainder of the year, lime alone being used in purifying, and the same quality of coals being carbonized, the average amount of sulphur was 8·30 grains, the maximum amount during this period being 11·05 grains, and the minimum 5·28 grains per 100 cubic feet of gas. By selecting the coals from certain collieries, there is no doubt that, even with oxide of iron purification alone, gas containing very much less than the permitted amount of sulphur can be obtained; but with any of the usual gas coals of the North Durham district, the amount of sulphur in the gas can be kept much below the parliamentary standard by the use of the lime process of purification, whilst if the oxide of iron process were employed with such coals, the sulphur would amount to from 20 to 30 grains per 100 cubic feet, as is the case at present with most of the coal gas used in the metropolis.—I am, &c.,

Newcastle-upon-Tyne, Jan. 16, 1871. JOHN PATTINSON.

WATER.

To Mr. Alderman Harle, Chairman of the Water Committee of the Newcastle-upon-Tyne Town Council.

Dear Sir,—I have the honour of presenting the following report, showing in a tabulated form the results of the monthly examination of the water supplied to this borough by the Newcastle and Gateshead Water Company during the year 1870.

The various mains of the water company are so arranged that there is a possibility of their conveying a different kind of water to three different parts of the town at the same time—that is, different qualities of Whittle Dene water, or a mixture in various proportions of these waters with that pumped from the Tyne, may be passing through the mains. In taking the samples for examination, I have thought it desirable to obtain samples from each of the districts in which it is possible thus to vary, and have examined them as to transparency, colour, and odour, so as to ascertain their fitness for use in these respects. I have for this reason obtained, each month, samples from Scotswood Road, Elswick Lane, and the Side. The samples from the Side have been more fully examined, so as to determine the total solid matters per gallon, the chlorine, the nitrogen existing as ammonia and as nitrites and nitrates, the amount of oxygen required to oxidize organic matter, and the hardness or soap-destroying power of the water before and after being boiled. The sediment deposited from the water on standing has also been examined through the microscope. By a comparison of the different results it will be seen to what extent certain constituents vary in amount at different periods, and, possibly, how this variation may affect the health of the town. The proportions of chlorine, ammonia, nitrites and nitrates, are much affected by the presence or absence of sewage matters, and the analyses furnished will show whether these substances exist in the water in abnormal quantities at any time. Similar examinations are made regularly of the waters used in London, Birmingham, and other large towns, and it may be useful to compare these waters with our own supply.

The following are the results of my examinations of the samples taken in the Side, reckoned on the imperial gallon:—

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.	Grs.
Total solid matter dried at 212° Fahr.	21·400	22·200	22·950	22·758	22·750	18·750	21·200	17·700	14·150	18·750	20·750	22·000
Chlorine	1·104	1·080	1·200	1·200	0·885	1·072	1·085	1·144	0·986	1·000	1·058	1·072
Nitrogen existing as ammonia	trace	0·002	0·004	0·004	0·004	0·000	0 003	trace	0·003	0·002	0·004	0·003
Nitrogen existing as nitrites and nitrates	trace	0·066	0·044	0·011	0·019	0·019	0·020	0 057	0·033	0·095	0·076	0·197
Oxygen required to oxidize organic matter, determined by excess of permanganate of potash acting for three hours	0·108	0·068	0·068	0·062	0·072	0·064	0·098	0·056	0·172	0·157	0·140	0·132
	Degs.	Degs.	Degs.	Degs.	Degs.	Degs.	Degs.	Degs.	Degs.	Degs.	Degs.	Degs.
Hardness before boiling	15·4	16·50	16·0	16·2	14·4	15·7	13·2	12·7	9·2	12·6	15·0	15·4
Hardness after boiling one hour	7·7	7·63	7·6	7·6	7·0	6·4	7·0	5·6	6·1	7·5	9·1	8·3

I have had occasion several times during the year to report that the water was unfit for use unless it were previously filtered, on account of its turbid condition, arising from the presence of clayey and other mineral and organic matters held in suspension. The Scotswood Road samples have been in this condition five times, and the Elswick Lane and the Side samples each six times during the year.

It will be seen on examining the above table that the amount of total solids in the water, and the hardness before boiling, are much less in the month of September than in the other months. This is owing to the increased quantity of Tyne water used at this time. The secretary of the water company informed me that two-thirds Tyne water and one-third Whittle Dene were used in this month. This statement is confirmed by the results of the analysis, for, knowing the composition of the Whittle Dene and Tyne waters, it is easy to calculate how much of each kind is being used. The analyses thus afford a check as to the proportion of Tyne water supplied to the town. The amount of oxygen required to oxidize the organic matter in the water increased very largely in the same month of September. This is owing to the brown peaty matter often found in the Tyne water. So far as my examinations have gone, I have found that the amount of brown or yellow colour in the water is almost in direct proportion to the amount of oxygen required to oxidize the organic matter, as ascertained by the permanganate of potash test. The figures given under this head may, therefore, be taken as representing the relative proportions of organic colouring matter in solution in the water. The amounts of ammonia and nitrites and nitrates are just about the same as those found in the metropolitan waters.

The water company only filter the water they draw from the Tyne; that from the Whittle Dene reservoirs, when clear, is cleared by subsidence in the reservoirs. On some occasions during the last year, when water was supplied so turbid as to be unfit for use, this was owing to local causes, but generally this condition of the water arose from the water company being obliged to supply the water before it had had time to become clear by subsidence in the reservoirs. Now that the Great Hallington reservoir is ready to receive water, it is expected that the water company will always have such a stock of water impounded as will enable them to allow ample time for its clearing by subsidence before it is sent through the supply-pipes of the town. If it is found that this is not the case, and that turbid water is still supplied, it will be for the council to take into consideration the desirability of urging the water company to filter the whole of their supply. The London water companies, with the exception, I believe, of those drawing their supplies from the wells sunk in the chalk, are compelled by Act of Parliament to filter their water. Although I have not yet detected anything in the solid matters in suspension which is likely to be injurious to health, it is easy to understand that animalculæ and other matters of a hurtful kind may occasionally be conveyed into the human system in this way, and that this may be prevented by careful filtration of the water. At all events, the water is rendered disgusting by the presence of solid matter in suspension, and is consequently unfit for table use.—I am, &c.,

Newcastle-upon-Tyne, Jan. 16, 1871. JOHN PATTINSON.

REPORT OF THE MANCHESTER DISTRICT ASSOCIATION OF GAS ENGINEERS.

The committee, in presenting their first annual report to the members, have great pleasure in stating that the operations of the association during the past year have been of an entirely successful character. Your committee beg respectfully to state that the association was formed in February, 1870, and was intended in no ways to derogate from that excellent institution, "The British Association of Gas Managers;" that the gas engineers of our district might have the desirable privilege of more often meeting together for an interchange of thought, for discussing all matters appertaining to gas manufacture and distribution, and for mutually dispensing and obtaining information and knowledge upon all gas matters peculiarly relative to the district. Our first general meeting was held in February, 1870, and at which the election of officers and adoption of rules were determined upon. Our second meeting was held in May, 1870, when returns from the gas-works in our district were exhibited, showing the cost per 1000 feet for the various items in gas manufacture and distribution; also copies of gas bills, rentals, manufacture, books, notices, &c., were provided for the instruction of the members present, and from which much useful and valuable information was derived. Our third meeting was held in August, 1870, when the members of our association were invited to inspect the Gaythorn station of the Manchester Corporation Gas-Works. The members were received at the gas-works by Mr. Macfarlane, the engineer, and by him conducted over the extensive and admirably arranged gas establishment; the fullest explanation being given to the inquiries of the members concerning the process of gas manufacture therein. Before leaving the gas-works a very cordial vote of thanks was presented to Mr. Macfarlane for his kindness, and was by him suitably acknowledged. On the reassembling of the members at the meeting-room, a paper on "The Supply of Gas to Public Lamps" was read by Mr. W. Longworth, Gas Engineer, Dukinfield, which produced an instructive discussion, and a vote of thanks was awarded to Mr. Longworth for his valuable paper. Our fourth meeting was held in November, 1870, and on this occasion the members were invited to inspect the Rochdale Road station of the Manchester Corporation Gas-Works. Twenty-seven members availed themselves of the privilege of inspecting this large, cleanly, and admirably arranged gas-works, and the fullest replies to any inquiry were freely given. At the conclusion of the inspection the members were very hospitably entertained at luncheon in the board-room at the gas-works, and unanimous votes of thanks were presented to the gentlemen who had accompanied us on our inspection through the works. On the reassembling of the members at the meeting-room, a very cordial vote of thanks was unanimously presented to Mr. Henry Lyon, engineer of the Rochdale Road station, and was by him very suitably acknowledged. At this meeting, a paper on "Naphthaline" was read by Mr. Harrison Veevers, Gas Engineer, Bolton. This paper produced a long, interesting, and exceedingly instructive discussion, and the thanks of the association were very cordially awarded to Mr. Veevers for his instructive paper. Your committee having thus briefly recapitulated the proceedings of the association's meetings during the past year, beg now to state that the number of members has increased from 24 in February, 1870, to 40 in February, 1871. A copy of the annual balance-sheet has been sent to each member, and from thence it will be seen that the members have paid their subscriptions like "gas engineers," and the treasurer can report

that he has £11 16s. 3d. in hand; and that, as appertains to this association, he owes nothing. In conclusion, the committee beg to thank the members for the good attendances at the general meetings of the association, and they respectfully state that nothing shall be wanting on their part to secure for themselves and their services the goodwill and confidence of the members of the Manchester District Association of Gas Engineers.

OFFICERS FOR 1871, ELECTED FEB. 25, 1871.

President, Mr. Joseph Wood, Bury.
Treasurer, Mr. Harrison Veevers, Bolton.
Hon. Sec., Mr. William Longworth, Dukinfield.
Committee, Messrs. James Jacques, Stockport; Isaac Kelsall, Ashton-under-Lyne; John Burgess, Huddersfield; William Smith, Hyde; Henry Lyon, Manchester; John Booth, Stalybridge.
Auditors, Messrs. James Braddock, Droylesden; David Brandwood, Ratcliffe.

PURCHASE OF THE PERTH GAS-WORKS BY THE POLICE COMMISSIONERS.

A Special Meeting of the Police Commission, called by requisition, was held on Monday, March 6—Lord Provost PULLAR in the chair.

The LORD PROVOST concisely stated the result of the terms of agreement entered into by the committee of the commission and the committee of the gas consumers with the gas companies, in regard to the transfer of the gas-works, with all interests involved, and his lordship added that the committee strongly recommended the adoption of the proposed arrangements.

Mr. THOMAS (the clerk) read the minutes of two meetings of the Gas Committee held respectively on the 21st and 24th ult. At the former meeting a letter was read from Mr. George Gray, secretary of the gas company, asking a conference. The following is a copy of the minute of the committee meeting held on the 24th ult.:—

Present:—Lord Provost, Dean of Guild, Councillors Jamieson, Walker, and Richardson—The Lord Provost, Presses. The sub-committee reported that they, along with Messrs. Robert Pullar and Shields, met the deputation from the consumers, and the following deputation from the gas companies—viz., Messrs. Burns, Jamieson, and Dewar, directors, and George Gray, clerk and treasurer of the Perth Gas Company; James Gowans, director and treasurer, and Robert Martin, clerk of the Perth New Gas Company. The following heads of agreement were ultimately adjusted:—1. The companies to take 6½ per cent. of annuities on £45,000 of stock, and to transfer their whole property, &c., of every description, except stores in hand, cash, and outstanding debts due to the companies; the companies, on the other hand, paying their own debts. 2. The commissioners to pay value for the stores on hand, and a sum not exceeding £200 to the companies for their parliamentary expenses in promoting the bills. 3. The transfer to be at 11th of November next. The meeting (Councillor Jamieson dissenting) approved of the foregoing report.

The LORD PROVOST moved that the terms of agreement be approved of. It had been reported to the Gas Committee that in all cases where a transfer of gas-works took place the community paid the whole of the parliamentary expenses of both sides; but in the present instance, Mr. Gray, after a good deal of battling, agreed to accept £200 as the maximum amount of expenses. Should they be less a deduction would be made; but his lordship did not think they would be lessened. In addition to this £200, the commission would require to pay all their own expenses. His lordship then said he had very great pleasure in moving the adoption of the agreement. He was convinced that the transfer of the gas-works to the Police Commission was the best thing that had occurred in the city of Perth for many a long day, and he had not the slightest doubt that it would prove to be one of the greatest benefits that had been conferred on the community. The bad feeling existing in the town would be allayed, and the agreement would doubtless turn out to be a favourable arrangement for all parties. If they had paid less money, it would certainly have been a much better arrangement; but, dear as the purchase was, the result would be decidedly advantageous to the public. He had made very extensive inquiry as to the probable cost of producing good gas, and he was satisfied that, even to begin with, the price per 1000 cubic feet would not exceed 5s.; at least for some time to come it would not be over that price. The manufacture of the article would be in the hands of the community; and, after paying the guaranteed annuities, the gas could be supplied to the public at prime cost. Of course, if the public sent men to the council board incapable of managing the works, it would be their own fault; but there would be a great stimulus to send the right stamp of men, having the important matter of the gas-works management before them. He congratulated the commission and the community on the equitable and amicable arrangement which had been adjusted. He could hardly pass along the streets without being stopped by disinterested parties who congratulated the commission upon the arrangement they had entered into, and, judging from the general state of feeling in the town, the public were apparently highly satisfied, believing that the commissioners had done the right thing

The DEAN of GUILD seconded his lordship's proposition. He was glad to see the end of the vexed gas question. Six years ago he took an active part, along with a number of gentlemen in town, to found a movement with the object of obtaining good and cheap gas; but, notwithstanding that they exerted themselves greatly, suffered much pain, and endured great fatigue, they did not gain what they expected. It was evident no movement would result in practical good to the citizens of Perth unless the gas-works were got into their own hands. At the time referred to the town was strongly canvassed, and he was bold enough to take a prominent part in the movement. It was proposed to start a new gas company, and £1 shares were set on foot, and 3000 shares—1000 in his own name—were taken out; but the movement did not meet with large public support. However, there was now a prospect of the community getting the gas-works into their own hands, and he hoped they would never regret the bargain they had made.

Mr. JAMIESON said he perhaps might be allowed the opportunity—as in all likelihood the present meeting would be the last occasion which would be vouchsafed for discussing the important matter of purchasing the property of the gas companies—of stating his reasons for dissenting from the resolutions of the Gas Committee, of which he was a member, and from the last act of the commission in buying the gas-works at the high price of 6½ per cent. of guaranteed annuities on the capital of the companies. He felt certain that a discussion on so important a subject would have the beneficial effect of impressing upon the community the absolute necessity of being careful and prudent in the management of the gas, for he thought the bargain made was of such a nature as to make it extremely doubtful if the commissioners would be able to sell the gas to the public at the same price that was charged at present by the gas companies. The mistake the commissioners invariably fell into was, entertaining the idea that the gas companies always paid the shareholders 8 per cent. When the companies sold the gas at 6s. 8d. per 1000 cubic feet they paid 8 per cent.; but when they reduced the price to 5s. 10d., which was a deduction of £1200 from the amount of dividend, they could not be expected to pay so large a per centage. Of course, if they never required to repair their works, or had no bad stock, or no writing off of accounts, they might be able to pay 8 per cent.; but with the reduction in the price of gas they would require to provide as hitherto for the deterioration of the works, and for other expenditure. Since the amalgamation of the two companies, and after they had made favourable terms, a dividend of 8 per cent., it was said, had been allowed; and the companies accountant had stated that they could have given 9 per cent. But what better criterion could be obtained than the market price of the gas shares? In the open market the selling price, he had been told, was £30 per share, which represented the nominal capital of the companies at £45,000. But the commissioners compelled the companies to sell their property, and it was well known that Parliament allowed so much more than the price which could be realized in the market, consequent on a compulsory sale. He believed it was 10 per cent. that was allowed. If so, then, instead of £45,000, the price would be increased to £49,500 or £50,000, which was the real value of the companies stock, tested in that fair, legitimate, and honest way.

Mr. M'INTOSH asked if that was generally the per centage allowed for gas-works.

Mr. JAMIESON replied that 10 per cent. was fixed under the Lands Clauses Act.

Mr. SKEETE: To the value that the arbiters fix.

Mr. JAMIESON: Just so, and that was the best possible test of the real price of the companies property. But the commissioners have resolved to give £14,000 more than the sum which would have been fixed upon by the parliamentary arbiters. They have agreed to give £63,260. But there was another way to test the fair price of the works. Take the mode applied by Mr. Barlow, C.E. Find what would be the capital sum necessary for providing new and efficient gas-works, deduct from that amount the sum that would be required to put the old gas-works into complete repair, and allow the dividend Parliament would give. Take the report of Messrs. Foulis and Laidlaw. They struck the price for new works at £30,000. The necessary expense to put the works above ground into complete repair they estimated at £5000; the pipes were not mentioned. Deducting the £5000 for repairs from the £30,000, the sum of £25,000 would be left, upon which Parliament would allow 10 per cent. of a maximum dividend, or £2500. But Mr. Barlow stated that 9 per cent. of the fixed annuities was equal to 10 per cent. which Parliament would have fixed. Mr. M'Neil had stated the case wrong when he spoke on a previous occasion of the £2500 of dividend, for he stopped short of what was further required to be deducted. Additional allowance required to be made for the pipes underground, which were stated to be in a very deficient state; and, supposing they allowed £4000 or £5000, the capital would be reduced considerably, and it would be found that £2000 was the fair maximum annuities for the gas-works. Alluding to the probable price at which the commission could sell gas, Mr. Jamieson observed that, irrespective of the expenses of making the gas, the annuities payable to the shareholders of the companies would amount to £2812.

The DEAN of GUILD: And 10s.

Mr. READDIE thought it was too bad to annoy Mr. Jamieson in the delivery of his speech.

Mr. ALEXANDER said Mr. Jamieson was taking up too much of the time of the commission.

Mr. WOTHERSPOON: I do not think that.

Mr. JAMIESON: Looking at the importance of the matter, and the fact that this is the first occasion that the question has been discussed in public—and I do not think I am discussing it in an unfair manner—I am fully entitled to express my views.

Mr. HONEY: Go on.

Mr. JAMIESON: For the annuities we have to pay £2812.

The LORD PROVOST (addressing Mr. Jamieson): If I am not mistaken, I gave you an opportunity of discussing this matter at the last monthly meeting.

Mr. JAMIESON: I do not think it, my lord.

The LORD PROVOST: I have a recollection of that kind.

Mr. JAMIESON: We are called upon to ratify a bargain, and I think we have——

Bailie HEWAT interposed, and said that the provost did allow Mr. Jamieson to get his own way of it at the last monthly meeting—to discuss the question in committee.

Mr. JAMIESON: I may go on now. There is, in the next place, the interest of the money immediately to be laid out on the works.

The LORD PROVOST: Not immediately.

Mr. JAMIESON: I will come to that immediately, my lord. He then said that the commission would require to lay out for structural works the sum of £5000; also the interest on the sum required for the expenses of the bill, the subsidy to the companies, &c., which would increase the annual outlay to £3312, which represented 2s. 0½d. on every 1000 cubic feet of gas, assuming—according to Mr. Barlow's calculation—32½ million feet was the consumption. The sinking-fund provided for in the bill he would take at £500, and that was another 3½d. on the 1000 cubic feet; 2s. 4d. had, therefore, to be paid on each 1000 cubic feet of gas before one particle could be given to the public; and, supposing the cost of making to be 4s. 3d., 6s. 7d. would have to be the price. Even viewing the matter in the most favourable light, by accepting Mr. Barlow's statement that gas could be made for 3s. 4d. per 1000 cubic feet, the price would be 5s. 8d., inclusive of the expenses of management or of keeping up the buildings. They should not be deluded into the hope that the moment the gas-works were in their own hands competition would be at an end. One of the speakers at the recent meeting in the city hall said he had a plan in his desk which, if he carried out, could enable him to make gas at 3s. per 1000 cubic feet, and what was to prevent him and others in the same position saying, "If you do not give me a deduction I will make gas for myself." If the deductions were taken at 2½ per cent. over the whole consumption, the price of the gas would then be brought to exactly what it was at the present moment—viz., 5s. 10d. per 1000 cubic feet. Looking at the whole facts of the question, he must say that the commission had not made a good bargain with the gas companies. He was quite aware that in course of time, when the consumption increased in town, some slight advantage might accrue; but they had to keep in view that every increase of consumption was necessarily accompanied to a great extent by an increase of expenditure. They must put in new and larger main-pipes. In many of the streets in town there were two mains, and consumers were burning gas from both of those mains; and the moment that the one main went wrong, both would require to be replaced. They were on that account in a worse position than other towns which had purchased the gas-works, where there was only one main-pipe. However much he was opposed to the bulk of the commissioners, he thought he was quite enabled to express publicly and openly his views on the question, and explain the reasons that induced him to dissent from the other members of the Gas Committee. At the same time, now that a bargain had been made, he should do his best to give effect to it, and would heartily co-operate in carrying out the arrangement, which he hoped would, in the long run, at all events conduce to the welfare of the community. He, however, moved as an amendment that the terms of agreement be not approved of in the meantime.

Mr. READDIE supported Mr. Jamieson's views, and seconded the amendment.

Mr. RICHARDSON thought that the full gist of Mr. Jamieson's argument was simply that the report the commission got from the engineers in Glasgow and the advice obtained from Mr. Barlow were not sound, so to speak. So far as he knew the engineers, they were men of the highest respectability; and he did not think that a gentleman standing as high in his profession as Mr. Barlow did would be the person to give bad advice. Mr. Jamieson ought to have considered well before attacking the professional character of Mr. Barlow in the way he had done. He (Mr. Richardson) was sure that Mr. Barlow was a man of sterling honour, and would not give the Perth Commission or any other public body fictitious counsel. Messrs. Laidlaw and Foulis were gentlemen who could not be guilty of the conduct which Mr. Jamieson would attribute to them. Mr. Jamieson, in his argument, had altogether overlooked the circumstances they were placed in in Perth. There were two gas companies, and, not like other towns which had only one capital fund to buy up, there were the united capitals of the two companies to purchase. The result of the arrangement, he was certain, would allay the unpleasant agitation and ill-feeling existing in the town, and also instil confidence in the commission which had not

been evinced by the public towards the gas companies. Although cheap gas could not be expected immediately, yet, when they could give the public gas at the price at which it was made, a great advantage would be gained. He understood Mr. Jamieson to refer to Mr. Morison's letters published in the newspapers, when he said that Mr. Morison advised the companies to pay 9 per cent., and showed that they were able to do so: but now the community had a chance of getting the whole concern into their own hands for 6½ per cent., which was a saving to begin with of 1¾ per cent.—*i. e.*, if 8 per cent. was the dividend allowed to the shareholders. He thought that in the hands of the commission the expenses connected with the management would be considerably lessened. The expensive salary of a secretary, for instance, would be saved. Of course, a good deal would depend upon the management; but with a staff of clerks and a committee of the commission, aided by a qualified superintendent, the gas-works would be very efficiently managed. He (Mr. Richardson) would have liked to have got the works at 6 per cent., but, rather than run the risk of having to pay more, he preferred the course that had been taken by the Gas Committee; and they should remember that in Glasgow, where the public men were not less acute than in Perth, they had agreed to give the gas companies 9 per cent. on £300,000, while the shareholders were only making 10 per cent. On another large sum of capital, on which they paid 7 per cent., the corporation had agreed to pay 6¾ per cent. He had not met with anybody who said the committee had not done well in the circumstances: on the contrary, general approval was expressed. The Lord Provost ought to be congratulated on the manner in which the negotiations had been conducted by him on the part of the public, and, in after life, when the gas-works, under the new management, were in full working order with great benefit to the community, his lordship would doubtless rejoice that he had been instrumental in carrying out such a measure of reform. Mr. Richardson concluded by supporting the Lord Provost's proposition.

Mr. M'NEIL said that, as his name had been prominently mentioned in Mr. Jamieson's luminous speech, he felt bound to make a few observations. He congratulated Mr. Jamieson upon making his grounds of opposition somewhat clear before the present meeting of commission, because he had never managed to do so at any of the committee meetings. As a member of the Gas Committee, Mr. Jamieson dissented and disapproved, without giving any reasons for doing so.

Mr. READDIE: That is not true.

The LORD PROVOST: It is very unfair and unparliamentary to speak in that way, Mr. Readdie.

Mr. READDIE: I have no hesitation in saying that I understood Mr. Jamieson as well in committee as I did to-night.

The LORD PROVOST: I am obliged to Mr. Jamieson for explaining himself on the present occasion; but I know he declined over and over again to make a statement of his views.

Mr. JAMIESON was about to rise to his feet, when

Mr. M'NIEL proceeded to observe that, however talented Mr. Jamieson was as a member of commission, he (Mr. M'Niel) would certainly be very chary in appointing him on a similar committee to the Gas Committee in future. In reply to Mr. Jamieson's accusation, that he (Mr. M'Niel) had stated the gas case on two occasions wrong, he must say he certainly did not include Mr. Jamieson's wonderful calculations as to the pipes underground; and if there was one point more misty than another in Mr. Jamieson's speech that night, it was in regard to those underground pipes. Taking the worst view of the case in every possible way, as explained by Mr. Jamieson, he came pretty nearly to prove that the commission did not offer too much in tendering £2500. More than that, he went to show that the expenses, amounting to £10,000, would add 2s. 4d. to the price of gas. The committee were informed on the best authority that good gas could be manufactured for 2s. 9d. or 2s. 11.—the former price he understood; so, adding Mr. Jamieson's large bill of expenses, gas could be sold for 5s. 1d. per 1000 cubic feet. Then the consumption of gas—calculated at 32½ millions, but which was nearer 35 millions of cubic feet—would increase. He thought the bargain made was fair and honourable. The commission came up £200 to meet the gas companies, and the companies were expected to come down £200 to meet the commission; but it was better for the commission to yield £112 10s., which was hinted at being only a single salary, than fight the question of so trifling a difference before Parliament. Mr. M'Neil expressed the pleasure it had afforded him to co-operate with the Lord Provost in carrying out the arrangement with the gas companies; and the community, he believed, would be highly satisfied when everything was accomplished.

Mr. HONEY sympathized with many of the remarks uttered both by Mr. Jamieson and Mr. M'Neil. The town had paid too much for the works. He did not think they should have gone beyond 6 per cent.; but he was prepared to support payment of another quarter per cent. rather than go to Parliament, because, in all likelihood, they would have lost more than the difference if the bills had been contended before a committee of the House of Commons. An amicable arrangement had been entered into, and he had no doubt that the commission would be able to supply gas at 5s. per 1000 cubic feet. It would be stiff work for the first two or three years, but ultimately cheap and good gas would be manufactured. His lordship and the members of the commission who co-operated with him in the negotiations had had a hard nut to crack; there were many difficulties to contend with, but they had all been overcome.

Mr. JAMIESON, by permission of the Lord Provost, remarked that the minutes of the Gas Committee would prove that he differed on two occasions. On one occasion he moved a motion.

The DEAN of GUILD: You did.

Mr. JAMIESON: And on the other occasion I expressed an opinion adverse to the general tone of the meeting.

The LORD PROVOST: You proposed to send back the money to the different parties.

Mr. RICHARDSON: He recommended that both bills should be withdrawn rom Parliament, and the whole expenses up to that date paid, and the balance handed back to the subscribers. In reply to which a member of the committee said, "Yes, Mr. Jamieson, and then the committee should go in a body to Murray's Royal Lunatic Asylum."

Mr. WOTHERSPOON expressed himself in similar terms to Mr. Honey.

Bailie HEWAT said it would be in the recollection of the members of the commission that when the question of purchasing the gas-works was first introduced, he said most distinctly that it was not a Perth question, as the various populous towns in Scotland were bestirring in the same direction. He then thought a general bill should be introduced into Parliament, but advised that Perth should not move in the matter single-handed. Referring to the agreement, the bailie remarked that he quite approved of it. The Lord Provost, and those who had acted with his lordship, had shown much wisdom and prudence in their transactions. Some folk might say that there were unreasonable men on the Gas Committee; but it was certainly a very improper style of business for Mr. Jamieson to set up his argument in opposition to the calculation of professional men.

Mr. M'KAY supported the amendment. Why, he asked, did the committee give 6½ per cent., without first calling the commission together to ascertain their views?

The LORD PROVOST: The committee have not done that. They only recommend 6½ per cent., and it is for you to approve or disapprove of their arrangement. His lordship then vindicated the conduct of the engineers, observing that Mr. Barlow had been engaged by the Glasgow, Aberdeen, and Dundee Police Commissions in a similar capacity; and Messrs. Laidlaw and Foulis were gentlemen of extensive experience and good character. If the commission had engaged some charlatan, perhaps he might have launched them into expenses to the tune of £5000, by urging them to go to Parliament.

The Lord Provost's motion was then approved of—Messrs. Jamieson, Readdie, and M'Kay dissenting.

Messrs. Readdie and Jamieson resigned their position as members of the Gas Committee; and Mr. Honey, on the motion of Mr. WALKER, was appointed to fill one of the vacancies.

The terms of agreement were then read over by Mr. Thomas.

The LORD PROVOST remarked that the transfer would perhaps take place at the end of the first quarter, instead of at Martinmas next. The commission then adjourned.

WATER-METERS.

At the Twelfth Ordinary Meeting of the Society of Arts, Adelphi, London, on Wednesday, Feb. 22—JOHN HICK, Esq., M.P., in the chair,

The paper read was—

ON WATER-METERS.

By Mr. FREDERICK E. BODKIN.

The question of measuring water supply by meter has for a great many years been occupying the attention of engineers. Ever since 1824 a yearly increasing number of inventions bearing upon this important subject, and amounting at the present time to a total of 313, have been brought before the public, in which are included patents taken out in England and communications from foreign engineers which have been registered at the Patent Office; yet, with all this expenditure of ingenuity, it is generally allowed that there is no meter at present in really practical use which may be considered an accurate, or, in many ways, a satisfactory machine.

If we take a review of the time which has elapsed since 1824, when I stated the first patenting of a water-meter is on record, we find that up to the year 1851, a period of 27 years, thirty different inventions had found their way into public notice; whilst, during the ten years succeeding, or up to 1861, no less than 90; and again, from 1861 to 1871, or the present time, 193. I do not mean to say that all these were for separate and entirely different machines; the larger portion were so, but a great many only specify certain improvements in previous inventions, or apply them to particular uses, a process which frequently implies the production of a practically new instrument.

There could be no better argument than the above statistics found in proof of the general demand for a good water-meter, since all invention is necessarily the result of some extensive public requirement. We may also adduce the fact that, unsatisfactorily as are all the meters at present supplied to the public, they have, at least those amongst them which present fewest defects in working, met with liberal customers among the water companies and private individuals, who are willing, at much personal inconvenience and expense, to refer the estimate of the supply of water to the arbitration of these meters. In large factories, for instance, or in the case of machinery driven by water or steam power, and large stabling establishments, hotels, and even the better descriptions of dwelling-houses, it has been found an advantageous arrangement, and examples are enumerated by advertisers of water-meters, pointing out the benefits likely to accrue to their purchasers, either on one side or other of the meters, from their use. For instance, a sum of £40 per annum paid in one case for water, rose no less than £1000 in favour of the suppliers, after the introduction of a meter. We may view the matter in another light, by comparing our dealings with water supply with our management of gas, not that the cases are in all respects similar, for gas is a luxury hardly yet a necessity of life, whereas pure, wholesome water is, in the truest sense of the word; but gas is, viewed scientifically, a very similar material to deal with, and is supplied by volume through pipes, and is turned on and off as required, and measured and paid for by meter. Moreover, by comparisons of equal volumes, we find that water is the more expensive commodity of the two, which is an additional argument favourable to the use of water-meters under certain conditions, even though there were more difficulty and expense in obtaining them.

If, instead of viewing the extreme cases I referred to above, we consider in a more extensive aspect the question whether the invention and use of a good water-meter would be advantageous to householders and other consumers alike, one cannot but feel that the present system adopted for the general public, of payment according to the rated or means of each separate consumer, is a most wise and liberal arrangement, hanging the chief burden of expense on the wealthier classes, and supplying an equal necessity of life to the lower orders at greatly reduced cost. Nor would the introduction of meters necessarily relieve any particular class, since the same expenditure would have to be defrayed as our requirements of proper purity and supply at present entail on the several water companies, whilst it would certainly act very prejudicially to the appearance and health of the "great unwashed" of our large towns, who would be only too anxious to reduce their water bills to a minimum. Perhaps, however, with the introduction of constant supply the general use of water-meters might become an advantage—almost a necessity—to prevent waste; but in London, where this would be most severely felt, constant supply is, as yet, only a very remote possibility.

There are also other uses to which water-meters may be applied, such as calculating the supply of water to steam-boilers, for the purpose of ascertaining their evaporative power; also the expensiveness generally of water and steam power, a means of accurately judging, which would enable the engineer, with far greater facility, to arrive at their comparative excellencies. The great difficulties which surround the designing of a good water-meter must excuse the ill success, so far, of inventors in meeting this demand; these may be better judged of by a short statement of some of the offices required of such a machine.

Firstly, a water-meter should register with accuracy—that is, within 1 per cent. of the truth; and this, it must be remembered, not under a uniform rate of flow of the fluid, but under every possible variation of pressure, from a head of only a few feet up to 200 or 300 feet, unless, indeed, it be intended to act as a low-pressure meter, to some of which I shall call attention presently, and also under any ordinary variations of temperature.

Secondly, it ought to be of sufficient strength throughout to stand these high pressures, and even sudden alterations and blows under them, which form a still more trying ordeal.

Thirdly, it is very requisite it should be cheap, both in original cost and to maintain in repair subsequently. This latter consideration is very important, as under high pressures any bearing surfaces would be travelling at a great speed, and, even with the common impurities of water, would be liable to wear away very fast.

Fourthly, simplicity, both in number and shaping of parts, chiefly because all water-meters are liable to get soon clogged with a muddy deposit, and require cleaning, and any complexity renders this operation difficult and expensive; it also naturally infers great costliness in repairs when the machine gets out of order, a defect to which such would be particularly liable.

It also often happens that a meter may be left unused for a time, and the working parts become dry. This should not interfere with the accurate working of the machine on its again coming into use; it is also greatly to the advantage of any meter that it should be uninjured by the entrance of heated water or steam, when supplying steam-boilers or other machinery, where such are used; that it should form a closed valve against the return of water already passed through it; also that the register and work should be out of reach of interference of people desirous to tamper with them; and a very important consideration, that there should be as little loss of head or decrease of flow as possible in the water during its passage through. There are also peculiar ex-

cellencies, if we may believe the statements of advertisers, which recommend some meters for use in private dwellings, far in preference to others; for instance, a certain Frenchman, with the ardour of competition so peculiar to our neighbours, describes his invention as not only a perfect meter, but a useful and elegant ornament for a gentleman's hall or drawing-room.

When we come to consider more carefully the leading features of all this vast mass of invention, we find that it is mainly directed to the measurement of water, under two different conditions, low and high pressure—low pressure where the water is delivered from the meter entirely free from momentum; and high pressure where the water arrives at, passes through, and leaves the meter at the same, or nearly the same velocity. Low-pressure meters were in use some time before the introduction of the other description, are much more simple in design, and can be made to register with perfect accuracy, but they have now fallen into disuse, except in special cases, where a careful measurement generally of some fluid more valuable than water is required, irrespective of the time occupied in the process. It will be worth while to notice briefly the various ways in which this has been accomplished.

In the most simple method, graduated glass tubes are used in connexion with a barrel, or vat, or closed chamber, and by which the amount of fluid run off can be easily read. Another, almost as simple, consists in the use of a measure-chamber in connexion with an ordinary tap; the tap is at one end, and a valve at the other or feed end of the chamber. These are so connected that one turn of the tap handle allows the water access to the chamber, and closes the outlet; the reverse action closes the inlet-valve, and allows the measured quantity to escape for use; each turn of the handle is registered. This principle is applied in many ways, some constructing the measure-chamber large enough for a considerable supply.

A third makes use of a large vessel of known capacity, generally an upright cylinder, and places a valve on a properly fitted seating at the lowest part; there are also floats in the vessel, and while the valve is closed and the water rising, the float also lifts, and in doing so actuates lever arms, which by ordinary mechanism shift the valves when the vessel is full, the lower valve from its seating, and a cut-off valve attached to the inlet-pipe. One means whereby this is attained is by hanging a weight from the float over a pulley, fixing a cam on to the shaft of the pulley, and causing the cam to raise a long lever arm at one point of its revolution. As the arm rises and falls it moves the valve. The float when out of water, being heavier than the weight, falls with the water, and reverses the valves at the bottom. A register tells the number of rises and falls that have taken place.

A fourth group of inventions places two tanks side by side, or subdivides one by a central partition; in each are valves at the lower ends, and each contains a float. In one case a system of syphons is substituted, the supply-pipe is placed over the partition, and alternately made to direct its flow into one or the other subdivision; the floats rise in each alternately, and, in most cases, by a central axis, which they actuate by lever, change the direction of the inlet, and raise their own outlet-valves; the central axis has weighted arms attached, to ensure the instantaneousness of the action.

According to another device, a subdivided trough is centred on trunnions, and caused to tilt or tumble over from one side to the other, by the weight of water which has flowed into each division of it from a fixed inlet; the trough is generally made triangular in section, and so proportioned and centred that it shall not tilt until each division is quite full; the number of tumbles is registered in this case.

A further modification of the above arranges a number of these tumbling buckets round a centre spindle, their continual filling and tilting causing the spindle to rotate. Sometimes they are made to work in a water level, each bucket gradually sinking down to it. But when fixed, free to revolve, they are arranged so that each weight of water must overcome the resistance offered by an arm of a weighted lever, which comes in contact with a catch attached to each bucket, and will not allow it to pass until out-weighted. The revolutions are registered, and represent in amount so many buckets full each.

A very novel idea is to measure, by means of a gas-meter of ordinary construction, the amount of air exhausted from any closed chamber, from which the liquid is allowed to run, the amount of water extracted being taken as equal to that of the air registered.

Endeavours have been made to convert several of the above into high-pressure meters, by making them of sufficient strength, and causing them to work without loss of head by air compressed in suitable chambers.

From this brief account it will be readily understood that water can be measured by low-pressure meters with the greatest accuracy, but they are entirely useless for supplying large quantities at any speed. They always require the intervention of a cistern of considerable capacity, placed high up, and in large establishments a separate meter would be required for every cistern. They may, in fact, be considered quite inadequate to the requirements of modern water supply.

Among high-pressure meters a greater variety exists. They may be divided into two principal classes—those which give a positive registration of actual quantities of water, and those which register by inference from the flow or pressure of the water passing through them.

Amongst positive high-pressure meters various arrangements of pistons and cylinder hold the first place. The principle of these meters is to enclose in a hollow carefully bored cylinder of known capacity a piston free to move from end to end by the pressure of the incoming fluid, the piston being caused by this force to drive out the quantities of fluid already measured. This motion, and its degree of perfection, will depend mainly on the arrangement of the valves which regulate the inlet and outlet of the liquid.

In the simplest form, the piston, very carefully packed, is fitted with a long piston-rod, protruding from a packing-box at one end of the cylinder, and bearing one or two catches, which, just as the piston reaches the top or bottom of its stroke, come into contact with, or strike against, the ends of levers, causing the valves to shift; or the same is effected by a roller on the piston-rod running up and down in a slot in a bar of metal, and striking each end in turn; the bar, on receiving the blow, throws over a weighted lever, which alters the valves. Or by some a rack is used attached to the top of the piston-rod; this gears with a pinion on a fixed shaft, two catches are fixed on each side of the pinion, and these alternately throw over a weighted lever from side to side; the weight in falling turns a four-way cock. This last is a device used by Mr. Kennedy in his patent water-meter, one of the first ever brought into use. It possessed the advantages over others of the same time, that it allowed a continuous stream of water to pass without serious loss of head, and registered very correctly. But the acknowledged defects of expense and great complexity, and also the continual attention required to keep it in working order, have caused its gradual fall into disuse, for it was found as soon as the oil in the works, which are not in these meters in contact with the water, got thick, the tumbling-weight refused to fall, and the water passed through the half-open valve without registry, and fresh oiling was found necessary every few months.

Messrs. Chadwick and Frost, in their Manchester positive meter, cut a long flat strip off one side of the upper part of the piston-rod; against this flattened portion a roller is pressed at the end of a bent lever, the square ends of the strip or slot drive the other end of the lever at right angles to the piston-rod, causing it to actuate in that line of direction a valve, which allows the water to flow alternately through the connecting link to the back of two small circular discs; its pressure at once forces each forward in turn, carrying the main valve with it, thus forming a fluid pressure-valve. This arrangement is found superior to Kennedy's meter, and, in fact, has gained the ascendency over all other cylinder meters we possess; but it is an expensive meter, and the number of wearing surfaces it contains prevent that durability which a high original expenditure ought to ensure to customers. It will not either, without great additional outlay, stand exposure to heated water.

A French patentee specifies a long cylinder, containing two pistons joined by a rod, passing through a central division with bearings, on which the cylinder rocks, by the greater weight of fluid alternately in each end, the central bearing being hollow and arranged on the four-way cock principle, and opened and closed by the tilting of the cylinder.

A large number of meters have also been devised, with two or more cylinders as measuring vessels; these are fixed side by side, fitted with pistons, and their rods working a common shaft by means of cranks. By the revolution of this shaft, two eccentrics or cams are made to open and close the valves; these are sometimes placed between the cylinders, sometimes on the outside, and in one case, in a meter designed by Mr. Duncan, placed at considerable angles to the piston-rod. When the cylinders are placed in the same line, end to end, as is the case in some meters, the rod connecting the two pistons, by means of a long catch, is made to actuate bars placed parallel to the piston-rod and outside the cylinders. These bars move secondary valves, the primary valves being placed at right angles across the further ends of the cylinders, and driven by water pressure regulated by the secondary valves, thus forming a similar, but more clumsy, fluid pressure-valve to that used by Messrs. Chadwick and Frost. In some cases the cylinders are made so as to slide telescopically on one common cylinder open at each end, with a central water-tight division; but in this arrangement the valves are a great difficulty, and the accurate fitting of the cylinders is expensive.

When the cylinders are set at an angle to one another, it is generally, as in an invention of Mr. Jopling's, at right angles, and the piston-rod of one is made by direct action to open and close the valves of the other, the pair being enclosed in a water-tight casing.

An invention of Mr. Worthington's, of the United States, consists in an arrangement of two cylinders, each containing two plungers or pistons connected by a single rod, bearing a central division plate. The valves are placed between the containing cylinders, and the alternate spaces are connected by crossway passages, from one into the other of which the water flows before it leaves the meter.

The chief object aimed at by the combination of several cylinders is a continuous discharge from the meter, and the prevention of any concussion occurring in the pipes. This is so perfectly effected by Messrs. Chadwick's meter, that any additional complication and expense, such as these machines involve, is quite needless.

Another American method uses a cork piston or ram, packed with cupped leathers; and a Mr. Heppel furnishes a solid wooden cylinder, with an annular leather bag, and causes it to work loosely in a cylindrical casing. These have their advantages in cheapness and absence of friction, but their adaptability in continual contact with water is very questionable. The best form of piston for a water-meter appears to be a cylinder of metal, with a flange at each end, the intervening space being long enough to allow the travel of a rolling ring of india-rubber up and down each stroke of the piston.

There is yet another combination of pistons and cylinders which has been devised for measuring water. The inventor places a number of cylinders round a central shaft free to revolve, and attaches the heads of their piston-rods to the corners of an inclined plate centred on the central shaft; the pressure of the water against their pistons causes them to rotate, and their revolutions open and close their respective valves. They may also be placed along a common trough or pipe, and their piston-rods in gear with a common crank-shaft. They are free to oscillate, and, in doing so, valves at their junction with the main-pipe are alternately open to each side of a central partition in it, which divides outlet from inlet.

The next description of positive meters includes all which are constructed to work with flexible or elastic diaphragms. The principle of these meters is, that a perfectly water-tight partition shall be formed, capable of assimilating itself to either end of a containing chamber, its edges being firmly bedded in the sides of the chamber, so that water admitted on either side alternately will force the diaphragm tight against the other. The shape of the chambers used to enclose these diaphragms is generally that of a double sector, or a sphere, or with inclined sides and flat ends. The chambers are most usually broad and shallow, and made of two shaped plates bolted firmly together, with the diaphragm between them. This is made of leather or vulcanized india-rubber, toughened by layers of calico or prepared cloth. It is generally strengthened by a central plate of metal, to which a piston-rod is attached, which passes out of the chamber and actuates the valves.

In one patented by Mr. Ramsbottom, in 1855, there are two diaphragms in doubly conical chambers, the rods of which turn a common crank-shaft. On this are two mitre wheels, which turn a rotary valve between them.

In a German meter, the rod actuates a lever with a chordal rack attached to the further end. This gears with a pinion, a crank on whose shaft moves the valves.

In another meter, four diaphragms are used at right angles, and all driving the same central shaft by means of cranks. From this shaft the registry is taken, and it is made to distribute through valves the supply of water to each pair in turn.

Meters of these descriptions will work with great accuracy, whilst the diaphragm remains entire. But it has been found impossible to discover any material which will endure active work with certainty; and, as soon as the smallest flaw occurs, water passes without registry.

Closely allied to meters of this description, are those whose measuring-chambers are made of compressible bags or cylinders. One of the simpler forms of these was patented in 1850. It consists of a water tight chamber, containing two compressible cylinders, distended with metal rings at intervals. Their upper ends rise and fall vertically as they fill and empty, raising and lowering each end of a bar with them. Chains from these ends pass over separate pulleys, and are attached to the ends of a cross handle of a four-way cock. Another design fastens two such cylinders end to end on a rocking arm passing right through them. They rise and fall as they alternately increase and lose weight, and alter valves seated at their point of connexion.

Compressible tubes have also been often suggested as water-meters; for use as such, they are wrapped round a centre cylindrical core, or coiled in a ring on a circular plate, and a pair or more of rollers, revolving round a shaft placed in the centre of the bag, and pressing tight against it, are caused to move by the pressure of the water entering one end of the bag, and forcing the rollers before it, in order to escape at the other extremity. By the time one roller has arrived at the end of the bag, a second comes into play; thus a series of waves of equal and known amount are continually passing through the bag, and being registered by the central shaft. An invention of Mr. Siemens makes use of a similar principle, by causing waves of liquid to pass down a tube of rectangular section, between the sides and a flexible central division. To all such meters the same objection holds as in the case of the diaphragm meter—that they are most uncertain in duration, especially if liable to stand idle, and their flexible portions to get dry and hard.

An entirely different description of meter are those which work on the principle of rotary force-pumps or fans. They are usually made with cylinders or axes revolving either in the same centre or eccentrically in outer cylindrical casings with closed ends. The simplest form is that of a plate sliding in a hollow cylindrical shaft or an elliptical disc, sliding on a crank and revolving in an epicycloidal chamber; the inlet on one side, the outlet on the other. The fluid continues to flow, and the ends of the plate or disc cut off equal quantities of

fluid, and register the number of revolutions. Or the centre cylinder may be concentric with the outer casing, and have one or more flat vanes of metal let into slots in its periphery, which are forced into it at a certain part of its revolution, between the inlet and outlet holes, by a bulge or indent in the outer shell, causing the periphery of the inner cylinder to revolve in close contact with it, and forcing out the water included between any two of the vanes. These vanes are carefully packed and must revolve in close contact with the outer circle, and for the purpose of always keeping them tight against this, a cam is placed inside the inner hollow cylinder, which forces them out at all parts sufficiently.

A French invention proposes to shut up air in the inner cylinder, and trusts to its compression and expansion to keep them in gear.

According to another, an eccentric axle is fixed inside the inner cylinder with four short arms. On to these are hinged the travelling vanes, which at a certain part of the revolution, where required, bend at the hinges and recede, and afterwards again straighten and are forced forwards.

In these machines the accurate fitting and easy travel of the vanes is of great importance; but however carefully this may be carried out originally, from constant use these machines soon give signs of wearing, and neglect to register accurately.

Some inventors make use of oscillating vanes or pistons swinging round in hollow cylinders from one side to the other of a fixed partition, the inlet and outlet being on each side and reversible by valves; and even more complicated arrangements of two or more swinging vanes, sometimes in adjoining cylinders, and other equally impracticable machines, have been proposed.

A great many adopt the method of hinged vanes or floats, capable of lying close alongside their centre spindle, and of spreading out against the encasing cylinder under pressure of water. After the principle of the fan, the vanes are made concave against the pressure of the water, and are hinged on to a cylinder so made to revolve eccentrically, that just before it reaches the inlet opening the blades are folded closely down, but on passing it they spread, and do not again close until they have passed the outlet.

Different arrangements of two cogged wheels, rolling in contact, have also been suggested; they are made of considerable breadth, and are placed in a double cylindrical casing, the one riding loose, the other fixed on a shaft which actuates the register. The teeth of such wheels must be very carefully made, in order to continue in contact at every instant of their revolution, the water being usually supplied immediately under the point of contact. It will be easily understood that the efficiency of the machine depends entirely on the good fitting of the gearing surfaces of the wheels, and which equally applies to the preceding description of meters, to the careful packing at each end of the drums. A meter which has not come into public use, but which has been found to work satisfactorily when applied to measure the water supplied to steam-boilers, consists of a string of balls fitting accurately in a loop formed in the supplying-pipe, and, passing over a pulley at each end, the water enters on one side of one pulley, and, carrying the string of balls before it, passes out at the other extremity. These balls cause the pulleys to revolve, and show how much water has passed.

Amongst inferential meters, which depend for their accuracy on their estimate of the velocity of the water passing through them, those which register the revolutions of an annular ring of metal, fitted with floats or paddles round its periphery, are most numerous; the water in this case being admitted through apertures as nearly as possible at right angles to the surface of the floats, impinges against them and causes revolution in a very irregular proportion to the speed and pressure of the water. An invention of Mr. Ramsbottom's has been used to some extent, and consists of a wheel with radial floats. Another machine, by Mr. Taylor, is very similar. He uses a horizontal wheel, provided round the periphery with radial floats, and riding on a vertical spindle in a closed chamber. It is to be made of any material of the same specific gravity as water, in order to reduce friction on the bearings, and is driven by the water admitted through small holes close to the wheel. This meter has been used considerably in the North of England, but is found much inferior in correctness and power of discharge to others.

To ensure an even flow, which was the only condition under which these meters would work accurately, and to prevent low-pressure water from passing at all, several different methods have been devised. By one arrangement, the water is required to raise a clack-valve, held down to its seat by a delicate spring before it can impinge against the drum; by another, the water is caused to pass through a contracted elastic orifice; and by a third means, the flow of water in its action on the drum is regulated by a specially designed governor.

The next class of inference meters include all those which register the rotations of drums with screw-blades fixed round them. These drums are fitted into long cylindrical casings, and the water flows past them, having first been directed through fixed guides turning in the opposite direction, and causing it to impinge on the drum-blades at nearly right angles. An earlier invention of Mr. Siemens is of this description, who uses two drums, or two pairs of drums, turning in opposite directions, and set end to end in the same tube. The drums are made hollow, of a peculiar alloy, and have eight perfect screw-threads passed round each. The registration is taken off the central ends of the drum-shaft by means of mitre-wheels, and there are directing guides equal in number, but exactly opposite in direction between each.

A patentee of 1851 places a similar drum, but rather longer, on a valve seating in a vertical pipe; it is thus rendered capable of lifting before any impurity which may be carried along with the water. Some others use a great many series of drums and guides, and occasionally choose to admit the water without guides simply between two reversed drums on the same spindle. The accuracy of these machines depends largely on the careful fitting and balancing of the drums, and their continuing to work without friction, but even under the most favourable circumstances they will not register with sufficient correctness at varying pressures, the error generally tending towards insufficiency at low pressure, and rising above the real amount at moderately high ones.

A further improvement has been suggested and used by Mr. Siemens and others, on the principle of a Barker's mill, whereby the water is admitted into the interior of a chamber fixed on a spindle, out of which it flows by means of bent or curved hollow arms; the reaction of the outflowing liquid (for the vessel is entirely under water) causes it to rotate in an opposite direction; the spindle moves on a steel pivot, encased in a water-tight oil-chamber, the water is admitted through a dirt-box, the revolving chamber is furnished with retarding vanes, and the upper end of the shaft has a worm-wheel attached which works the register.

The above meter has found most favour before the public, both in England and abroad, of all the meters yet introduced, but notwithstanding its superiority it possesses many defects. It is expensive, and is not by any means certainly correct under all pressures; it is, besides, so very delicate that it continually requires inspection and repair. It will pass water through at low pressures with a very insufficient registry, and will work backwards without difficulty.

A great step in the removal of all the above defects, both in this and every other meter yet introduced, is exemplified in an invention by Messrs. Cook and Watson, a meter which has only lately come before the public notice. It consists of an upper plate, indented on the under side with a ring of thumb-holes, and riding loosely in a chamber over a lower plate, through which inclined inlet-holes are bored. The water rises through these holes, raises the upper disc, and acting against the square ends of the thumb-holes, causes it to rotate at the same time. This action, of course, requires some small power to commence, but as soon as the upper plate is lifted it must also necessarily rotate. When the supply ceases the upper plate falls, and forms a tight valve against the return of the water; and since during its period of revolution this plate floats in a film of incoming water, there are no wearing surfaces involved in the machine. Small stays are placed on the upper surface of the revolving plate, in order to produce regularity of motion under varying pressures, and appear, from the specimens I have at different times been enabled to test, to do so with complete success.

These machines are not expensive, and offer but small opposition to the flow of the liquid, and certainly appear to be the simplest and most practicable form of high-pressure meter yet invented.

A very different description of inferential meter consists in the use of a rod of alabaster, or other slowly soluble material, encased in a glass rod graduated, and at its lower end in contact with the running water. It is kept pressed down, and as it dissolves the top descends, and is supposed to denote the quantity of water which has passed. This seems very simple, but the readings must often be liable to considerable variation.

In presenting these remarks on water-meters, I must apologize for such insufficiency in the descriptions of the various ones I have noticed, and for any unintentional misstatements I may have been guilty of regarding any of them.

Mr. Webb desired to know whether the small power which it was stated was requisite to set the last-mentioned meter in operation would always be at hand under the ordinary pressure of the water.

The Chairman said, as he understood it, a small amount of pressure only was required to set it in motion, and then it would continually register correctly.

Mr. Pickstone said he remembered, when Kennedy's meter came out, that it frequently registered against the consumers, and, of course, was soon put down. A meter, to be held in esteem by suppliers of water, must certainly register either absolutely correctly or in favour of the companies, otherwise there was no chance of its success at all. If it registered air as well as water, it would do. Kennedy's meter, by occasionally stopping, registered against the supplies. As he was a director of a water company at that time, he remembered that on some occasions, in getting in the quarterly statements from parties to whom water had previously been supplied for steam-boilers per horse power, they found that, whereas previously so many pounds a quarter had been payable, they had, in fact, nothing to receive; the meter had stopped, and, of course, the consumers had not informed the company. Chadwick's meter, on the other hand, went on ticking all the time, and registered air as well as water. As a consumer, he should certainly object to a meter which went on constantly ticking, when he knew perfectly well that no water was being used. It appeared, therefore, that for domestic purposes there was at present no chance of any meter being introduced; at the same time, as a private consumer, he should much like to consume water by meter at any reasonable price per 1000 gallons, because he believed that private consumers paid a much higher rate for the water than would be properly chargeable to them if there was a fair average made of all consumers. When he paid £10 a year for his water, he thought it was infinitely more in proportion than the smaller consumer who paid, say, 12s. a year; and when he was a director of a water company, it came under his observation that cottages paying a rental to the owner of £6 to £9 a year, and paying a water rental of a few shillings a year, consumed very much more in proportion than large houses. If the meter last referred to was satisfactory, if the working parts of it were not liable to get out of order, and the meter itself were cheap, probably companies would allow private consumers to use it at a reasonable price. He did not know whether they would, or if the public had a right to insist upon their doing so, for certainly it would be no use to ask unless they had the right to insist, for there could be no doubt that directors of companies would discountenance the use of meters by small consumers. But, be that as it might, it was of great importance that some accurate means should be possessed of measuring water for manufacturing and such like purposes; but it was essential that the meter should be fair to both sides. In the case of gas-meters, consumers very often had a suspicion that they paid for 10, 15, or 20 per cent. more gas than they burnt; and sometimes, when meters had been examined, it was found that as much as 25 per cent. more was registered than really passed through the meter. It was the public, therefore, who required protection, they being on the weak side of the question. It certainly would be satisfactory to the public to know that they only paid for what they consumed.

Mr. Henry Christie Beloe (Liverpool Water-Works) said the question was of great interest to him, representing, as he virtually did, a population of 600,000, and it being his duty to see that they were properly supplied with water. Under these circumstances, the question of meters had been constantly brought to his notice, both with respect to their accuracy and more extended use, but he had always heard that the House of Commons set their face against the use of meters for domestic purposes. How far they might see fit to change their views, it was not for him to say. No doubt, in the coming session of Parliament, when he was told the whole question of the water supply of London would come under their notice, that might form one of the elements of the discussion; but, so far as Liverpool was concerned, it would make no important difference there, because the water supply belonged to the town, and the water was simply distributed to the public at the prime cost for interest of money and working charges. It had, however, often occurred to him that the use of meters would, to some extent, meet what he could not but think was the radical evil of all water supply—viz., the great waste which constantly took place. In Liverpool they charged 5 per cent. upon the rateable value of the house for the water supply, including every purpose to which the water might be applied, which he considered a very low rate indeed; and their great grievance was the infamous waste of water which frequently went on; and how to control that waste was, he believed, one of the great problems of the day. A gentleman sent by the Government called upon him the other day for information with regard to this matter, and with reference to the bill which he believed was about to be brought into Parliament, and he soon found that his views coincided pretty much with his own on this subject. As to the waste of water in manufactories, there was a check, because, the corporation not being bound to supply water to them, they were charged for what they consumed, and at a proper price. It was contended, on the one hand, that if meters were applied to domestic purposes, they would engender filth and the discontinuance of the use of water in a very lamentable degree; but, on the other hand, it must be remembered that on all these matters there were evils on one side or the other, and he believed such a system would greatly check the disgraceful waste which he had referred to; for instance, he had known even respectable persons leave the plug of their closets running for hours, days, and even weeks at a time; and, although there was power to bring such offenders before magistrates and fine them, this was a check which could very rarely be put in force.

Mr. S. C. Homersham said there were many places throughout the country where there was really no waste at all, and where it did exist, either in Liverpool or elsewhere, it was simply because the managers of the water companies did not know their duty. It would take too long to explain the whole particulars connected with this matter, but there were means easily provided, and in operation in numerous towns, and no waste of any importance took place, and that was where the system of constant supply was in operation. To return to the paper itself, the actual meters in practical use by water companies might be reduced to some five or six. The first, and perhaps one of the oldest, was Parkinson's, which, for measuring into a cistern under a low pressure, was a very good one; but it was only applicable unto such a case. Then there was an inferential meter largely in use, known as Siemens's; and this, if the water

was constantly flowing through a pipe, although the velocity might vary considerably, was a very good meter, and very reliable; but if the water was delivered into a cistern, as was the case in houses, and a gallon or a quart was drawn at a time, and then shut off again, it could not be relied upon, so far as his experience went. He believed that no inferential meter whatever could be made to meet these defects, not even the one referred to as No. 13. That required to be put in motion before it registered, and, if only a small quantity was drawn, it would not register. There was another meter in use, known as Kennedy's or the Kilmarnock meter, and this, when properly attended to, answered the purpose very well; and also the Manchester meter, which he considered cheap and satisfactory, although it was spoken of in the paper as rather expensive. It was largely used in the manufacturing districts in Lancashire, and he employed it in his own works. With respect to supplying water for domestic purposes by meter, it must be remembered that the Acts of Parliament only gave the companies power to charge consumers according to the rental of the house. Every Act of Parliament for a water company incorporated the Water Clauses Act, and by this Act the company was bound to charge in the way he had stated. Unless this system was altered, meters could not be introduced for domestic purposes. In one instance, however, he had obtained the introduction of a clause by which, if more than a certain quantity of water per quarter were used, the excess was charged for at 2s. per 1000 gallons; but, on the other hand, a minimum rental was charged, whether any water was used or not. This was done in the Caterham district, which, lying very high, there was a considerable demand for water for gardens and such like purposes; and it was considered only fair that, if extra water were used in this way, it should be paid for. It must, however, be recollected that water companies, unlike gas companies, did not manufacture the article which they supplied; they were, in fact, water-carriers, and it did not signify, comparatively, whether the person used little or much. What they required to be paid for was the interest on the outlay for the fixed plant, the pipes, and so on. For instance, certain pipes were required to bring the water for some miles to Belgrave Square, and, although many of the inhabitants were out of town for six or seven months in the year, they had to pay for the water during the whole time, because interest of money on the capital sunk was running on whether the water was used or not. In the same way, in the district he had before referred to, the inhabitants were frequently away at the sea-side for a considerable time, and, if they only paid for what they consumed, a much higher rate must be charged in order to pay interest on the capital at such times.

Mr. W. H. Michael said there were two reasons why the Legislature made a great difference between the supply of gas and that of water, as to the mode in which it should be supplied. In the first place, there had not been, up to the present time, any meter constructed so as to gauge accurately the quantity of water passing through it; it either registered too much or too little, or it was so delicate in its construction that the impurities which were always more or less present in water soon interfered with its practical operation, and it ceased to become an actual register. This had been one main element in determining the mode in which the supply of water should be charged for, and, as far as he could see, the meter spoken most favourably of was open, more or less, to the same objections; however perfect it might appear, when particles of sand and vegetable *débris* got into it, it would probably cease to act. The second and more important point, however, was this: the supply of gas was not an absolute necessity, but water stood in quite a different category, coming under the head of those things with respect to which the Legislature had, to some extent in the past—and, he believed, would still more in the future—interfere with and render compulsory; they would compel people to use water in order to avoid injury to the public health. It was, therefore, and must be, impossible to charge the poor in the same ratio as the rich; and, in fact, the object was to make the rich use as little water as possible, and the poor as much as possible; and experience had shown that, if the latter were charged according to the quantity used, none at all would be used in many poor dwellings. This was the main question, and in connexion with it was another—the supply of water by local authorities. He was one of those who believed that the water supply of the country would never be thoroughly carried out until it was in the hands of the local authorities; though, if this were done, of course it must be upon the principle of fairly remunerating those who had embarked their capital in existing water companies. There was now, he believed, a great unwillingness to confiscate private property of any kind for the public good, and therefore he had no fear of private interest not being properly compensated. There was in the public mind at present, unfortunately, so small an amount of information as to the necessity of drinking pure water, that it would be the height of imprudence to introduce the consumption of water by measure, which must necessarily tend still further to restrict its use amongst the poorer population. It must be borne in mind that no system of sewage in which water was extensively used as the carrier could be of any public good, but, on the contrary, would be a great public nuisance, unless the water supply were to a great extent under the control of the local authorities. From having sat as a Government commissioner, and taken part in local inquiries with regard to water supply, he would say that it was the duty of all persons to encourage the use of water in poor localities; and therefore, looking at this from a public point of view, the water-rate must be considered really as a tax, or local rate, imposed for the sake of a great public good. It was a local rate levied, not in accordance with the quantity of water used, nor yet altogether on the principle which had been laid down—which would apply almost with equal force to gas companies—but to secure a great public good; and therefore the rich must pay for the poor, the reason being that by the use of water the community at large would benefit in the matter of the public health, and therefore the benefit would come back to the rich in the sweeping away of those diseases which now affected poor and rich alike, the rich suffering from the neglect of the poor. Much, therefore, as an accurate means of gauging the supply of water was to be desired, he saw no probability of the principle being generally adopted with regard to private consumers.

Mr. Casella said his attention had first been called to the subject of water-meters by having been asked by a continental customer for a cheap, durable, and efficient water-meter. He therefore made inquiries of the various water companies, but he was sorry to say the result was anything but satisfactory. He was obliged to reply to his correspondents that nothing very suitable had come under his notice, although several new meters were announced as forthcoming. Then his attention was called to the last one mentioned by Mr. Bodkin, which certainly seemed to him at first sight to answer the purpose better than anything he had seen before, and further investigation had confirmed this impression. It did not seem open to the objections which most others were.

Mr. R. Rawlinson, C.B., said there could be no objection to water-meters for commercial purposes, and if anything approaching perfection could be attained, it would be a great advantage, but if any one was looking for a meter applicable to domestic purposes he would advise them to at once discontinue the search, being convinced that if such were discovered it would not be used. It would be absolutely impossible to supply water by meter in this country for domestic purposes. It was quite true that under the present system the rich paid much more than the poor, but this could not be helped if the poor were to be supplied at all. He could refer to districts where there was a constant supply of water to every cottage at a payment of 1s. a quarter, whilst people resident in London had to pay according to their rental; and he had no hesitation in saying, because he was always very careful that water should not be wasted, that there were customers of companies in which he was interested paying 1s. a gallon, who used double and treble the quantity he did in London (and of a far better quality), although he paid 30s. a quarter. But what would be the use of introducting meters? The poor could not pay for water by measure if any appreciable price were put upon it; whereas he, like all careful persons, used so small a quantity that the companies would have to put an exorbitant price upon it in order to get their rental. He had lately visited a town for the purpose of making inquiries on this subject, when he found that meters were introduced, although generally the water was not measured; in other words, the consumer had to pay a certain fixed rental upon his rateable value, whether he used any water or not, but if he exceeded a certain stipulated quantity, then he must pay for the extra supply. That was a good illustration of the saying—"Heads, I win; tails, you lose." Besides, there never yet was a meter which would register correctly when the supply was intermittent, and, therefore, they would be only applicable to cases such as those under the care of Mr. Homersham, who certainly managed his affairs most admirably where there was a constant pressure in the mains. He quite agreed with the latter gentleman, that the subject of waste was too long to enter upon on such an occasion. It was well worthy of a paper to itself, but he would say briefly that it generally arose either from ignorance or gross negligence, and the method of cure consisted in having proper fittings, properly put up and properly superintended. It would be as reasonable to expect a watch to go without winding up, or keep good time without ever being cleaned, as to expect water fittings to keep in order without being properly looked after. Where there was excessive waste, as there was in most places in England, it was entirely because the fittings were not properly looked after, and because they were of such a character that a careless servant might at any time leave them open, and thus a company had to pump in water at the rate of 30, 40, or 50 gallons per head, when it was now found by experience that from 6 to 10 gallons per head was a full supply, and amply sufficient for any community under any conditions. The question with regard to London was so important that it must press itself upon those who had the management of the matter; but certainly, if the Government interfered, and said that the companies must supply water constantly under pressure, the companies would have a fair claim to dictate what fittings should be used, and to superintend them when in use, in order to see that they were kept in order.

The Chairman said one thing was quite certain—the tendency of all the remarks had been to show that the most perfect meter was the best, and that what was wanted was one which should favour neither consumer nor supplier. As a rule, the inferential meters were the least accurate, because they were apt to continue in action after the water had ceased to flow, when stopped suddenly. With regard to the application of meters for supplying the poor, his opinion was that, if a really accurate self-registering meter could be found, it would be very desirable, for his experience seemed to show that where there was the smallest consumption there was the greatest waste; in his own town he knew that taps were frequently left running. If it were necessary, the poor could be supplied at a cheap rate per meter, so as to keep them in the same position as at present. Every day it became of greater importance to have a cheap and accurate water-meter, and, in conclusion, he must say that the model referred to as No. 13 seemed the best inferential meter he had seen, though he thought it must be open to the same objection as others of its class. He begged to move a vote of thanks to Mr. Bodkin for his valuable and interesting paper.

The vote having been carried unanimously,

Mr. Bodkin said he regretted that, through indisposition, the paper was not nearly so perfect as he had hoped to make it. With regard to the meter which had been referred to as No. 13, he might state that the small power which was required to set it in motion was simply that which was necessary to lift the upper plate of metal, which weighed only a few ounces, and therefore the meter possessed the advantage that water at a low pressure would not pass through it. If there were any head of water at all, however, it would lift the plate, and, when lifted, it must rotate and register the quantity of water passing. He might add that the stays, which he had stated were placed at the top of the revolving plate to regulate the action under varying pressures, appeared to answer perfectly, for he had tested the meter at both high and low pressures, and found it perfectly accurate. On this account, therefore, as well as from its simplicity and cheapness, and apparent improbability of its getting out of order, he could recommend it as the best water-meter which had come under his notice.

Minster Gas Company.—The annual meeting of the shareholders of this company was held in the National School-Room last week, under the presidency of D. Swindford, Esq. The report read by the secretary showed an income of £352 0s. 8d., and an expenditure of £253 3s. The capital of the company is £1300, in 200 shares of £5 each, fully paid, and 75 shares of £5, £4 paid on each. A dividend of 6 per cent. was declared, leaving a balance of £20 to carry forward, and after the dividend is paid a reserve-fund, unavailable for dividend, of £130. Mr. D. Swindford, retiring by rotation, was unanimously re-elected, and Mr. Alfred Swindford, of the Abbey, was elected a director, in the room of the late Mr. John Andrews. Votes of thanks were passed to the chairman, to the directors, to the auditors, and to the secretary.

Maidstone Water-Works.—A meeting of the shareholders of the above company was held on Tuesday, Feb. 28, at the offices of the clerk—C. Arkcoll, Esq., presiding. From the report presented it appeared that there was a balance in favour of revenue of £1922 19s. 8d., and that the amount of net profit for the year was estimated at £1039 11s. 10d. It was stated that the well and boring now going on had reached the depth of 653 feet from the surface. An accident had, however, occurred, which had necessitated the use of fresh apparatus, and it had been hoped that by the time the report was presented the supply of water would have been tested. This, however, had not been the case, and the works were still in course of progress. A dividend of 4 per cent. was declared, which, after reserving £200 to meet any necessary expense for machinery, &c., would leave a balance of £922 19s. 8d. to be carried forward The report was adopted.

Sevenoaks Water-Works Company, Limited.—The seventh annual meeting of the shareholders of this company was held at the Crown Hotel—Mr. E. C. Crouk in the chair—on March 1. The directors report, which was adopted, stated that the annual income of the company is considerably improving, and the balance of revenue will admit of the payment of a dividend of 4 per cent. on the paid-up shares, free of income tax, and which the directors recommend should be paid on the 6th of April next. The directors had, in pursuance of the authority given them, covered the reservoir, the works having been carried out satisfactorily by Messrs. Easton, Amos, and Co., under the direction of the company's engineer, at the cost of £440. During the past year six more shares had been taken up, five by Mr. James Easton, and 62 shares now remained to be disposed of, to which the directors looked to enable them to pay off the existing liabilities. The directors had succeeded in their opposition to the clause inserted in the bill introduced in the House of Lords by the South-Eastern Railway last session, seeking for powers to deal with the water in the tunnel, without reserving the water-works company's rights, and the taxed costs of the opposition of the directors were ordered to be paid by the South-Eastern Railway Company, and the directors expressed a hope that the vexed question had been settled, at any rate for some time to come. The retiring directors, William James Thompson and James Easton, Esqrs., and the auditor, Mr. J. W. Whibley, were re-elected. The proceedings closed with the usual vote of thanks to the chairman.

Eastbourne Gas Company.—The half-yearly meeting of the shareholders of this company was held on Feb. 27—Dr. Jeffery presiding. The chairman said they offered the shareholders 8 per cent. dividend, and that there would

be afterwards a balance of £133 4s. 6d. Mr. Bradford proposed a reserve-fund, and that £100 of this balance should be appropriated to that purpose. When they got into a better position, he advocated the putting away of about 1 per cent. to the fund. The chairman expressed himself as of a somewhat similar opinion, and said the matter would no doubt be discussed at the next meeting of the directors. The report, which was a very satisfactory one, was adopted.

TONBRIDGE GAS COMPANY.—The thirty-fifth annual general meeting of the Tonbridge Gas Company was held at the Rose and Crown Hotel, on the 1st inst.—Joseph Isard, Esq., presiding. The minutes of the general meeting and special meeting were read. The annual account of the receipts and disbursements, for the year ending Dec. 31, 1870, were submitted to the meeting, and it was proposed by Mr. Beuzie, seconded by Mr. Warner, and carried, that the accounts should be passed. It was then proposed by Mr. Rogers and seconded by Mr. Hodge, that a dividend of 15s. per share be declared and paid in accordance with the recommendations of the directors, to be paid on and after the 1st inst. This was carried unanimously. It was then proposed by Mr. Rogers, seconded by Mr. Crundwell, and carried, that a bonus of 5s. per share be paid to each shareholder, provided that each shareholder signified his assent in writing. The retiring directors were re-elected, and Mr. J. T. Baker elected a director. A vote of thanks to the directors for the very satisfactory manner in which the business of the company had been carried out during the past year was carried, and so was a vote of thanks to the chairman. A special meeting afterwards took place for the purpose of authorizing the increase of the capital of the company by the issue of 250 new shares of £10 each, and for the erection of a new gasholder, &c., advertised for in the JOURNAL OF GAS LIGHTING; and also for the purpose of altering the 29th clause of the copartnership deed of the company, so as to enable the directors to make up half-yearly statements of the company's affairs and declare half-yearly dividends. Mr. Crundwell fully explained to the shareholders the desirability of a new holder, capable of containing 51,000 cubic feet of gas, and the meeting fully coincided with those views. It was then resolved that the capital of the company should be increased £2500, by the issuing of 250 shares of £10 each. The chairman then read the 29th clause of the copartnership deed of the company, and it was resolved—"That the directors shall cause a general account or statement in writing of the affairs of the company to be made up to the 30th day of June and 31st day of December, both inclusive, in every year, containing a clear and faithful exposition of the affairs of the company, and that such accounts, certified, &c., shall be printed, &c. The directors shall cause a special half-yearly meeting of the shareholders to be held annually on the third Monday in August, for the purpose of declaring the amount of dividend to be paid to the shareholders on the half year's account of the company up to the 30th of June preceding such meeting; and that at the meeting to be held on the third Monday in February in every year, which shall be considered the annual meeting, the directors shall in like manner declare the amount of dividend to be paid to the shareholders, &c." By the statement of accounts for the past year which was submitted to the meeting it appeared that the receipts amounted on the capital account to £237 19s. 5d.—£2 16s. 9d. being the interest on the balance of £235 2s. 8d. The expenditure had amounted to £50 18s. 9d., so that a balance on that account is left of £187 0s. 8d., but £132 11s. 3d. is set down as liabilities. The receipts on the revenue account amounted to £3171 13s. 7d., of which the sum of £2373 16s. 11d. had been expended, leaving a balance of £797 16s. 8d. On this account the assets are stated at £2112 9s. 11d., and the liabilities at £564 15s. 6d. The price of gas, from the 31st inst., will be reduced from 5s. to 4s. 6d. per 1000.

GAS WELLS.—Gas wells of a very remarkable nature have been discovered in Ohio, and described by Dr. Newberry, of the Geological Survey of that State. Near Millwood two wells give out oil; two or three miles below these, in the valley of the Kokosing, borings have been made; and at the depth of 600 feet the augurs struck into vertical crevices, and sunk several feet without resistance. From these borings such a volume of carburetted hydrogen issued as was unparalleled in any of the oil explorations. The wells give out salt water intermittingly, throwing it to a height of more than a hundred feet. The gas of one of those wells, lighted at the end of a pipe 2 inches in the clear, set in the well-head, produced a jet of flame 20 feet long, and as large as a hogshead. The gas appears to be pure, and in quantity sufficient to light a large city.

THE RIVER CAM.—A legal difficulty has obstructed the measures taken by the Cambridge Commissioners for diverting the sewage of the river Cam. The board resolved at a meeting held some time back to apply to Parliament for an Act to enable them to carry the project for purifying the Cam into effect, when some commissioners took objection on the ground that the board did not possess the power to apply the rates for such a purpose. Since then proceedings have been taken in Chancery, and the opinion of Mr. Field upon the point raised was obtained, and he thinks that the expenses (£646) already incurred would be illegally paid out of the funds of the board. Under these circumstances, therefore, the scheme for diverting the sewage of the river is postponed. At a meeting of the commissioners recently held, the Master of Christ's College said the state of the drains which deposit in the river were discreditable and dangerous to the town. He was opposed to the mud at the outfalls being removed by hand labour, as that process would involve the exposure of the bed of the river, which was very objectionable at this season of the year. The best mode was to use the dredger, which could be done without drawing the water. The board agreed to this course.

THE RATING QUESTION.—Mr. Goschen, as President of the Poor Law Board, received a deputation, representing different municipalities in various parts of the kingdom, on the 10th inst., to confer with him respecting exceptional rating. Amongst those present were Lord Sandon, M.P.; Mr. Birley, M.P.; Mr. Bass, M.P.; and Mr. Cawley, M.P. The president was addressed by Lord Sandon; Mr. Picton, of Liverpool; Mr. Avery, of Birmingham; and Sir Joseph Heron, of Manchester. The object of the deputation was, in the first place, to point out the unequal pressure of rates in municipal boroughs by certain remissions in the exceptional low rating of railway companies, canal companies, arable land, &c., and it was stated that these were rated in only a small proportion of their value to the borough rates. It was asked that this exception should be abolished, and that all property should be placed upon one footing in the assessment for municipal borough rating. Mr. Goschen said it was inevitable that the question should come up for discussion and settlement this session, and therefore the Government proposed to deal with it, but in what way it was proposed to do this he could not at that time say. The deputation thanked him, and withdrew.

DR. STEVENSON'S REPORT ON THE GAS SUPPLIED BY THE IMPERIAL COMPANY TO THE VESTRY OF ST. PANCRAS DURING THE MONTHS OF JANUARY AND FEBRUARY, 1871.—In the month of January the average illuminating power of the gas was 14·4 candles, the maximum being 14·9 candles, the minimum 13·3 candles. The Imperial Gas Act says that the illuminating power shall not be less than 14 candles. The examinations are, however, made according to the Metropolis Gas Act, 1860; if they were made according to the requirements of the gas referees under the Imperial Gas Act, the illuminating power would be apparently increased by one-sixth, and then it would be seen that the gas has been always better than the Act requires. The gas was at all times free from sulphuretted hydrogen, as required by the Act. Ammonia was present on every occasion of examination; its amount was always small. Sulphur was present to the amount of 24·38 grains per 100 cubic feet. The allowable amount of this impurity is not stated in the Imperial Gas Act; 20 grains per 100 cubic feet was allowed under the old Act.—During the month of February the average illuminating power of the gas was 14·2 candles, the maximum being 14·9, the minimum 13·7 candles. The amount of sulphur present in the gas was 20·91 grains per 100 cubic feet. Sulphuretted hydrogen was never present on examination. Ammonia was present on every occasion of examination.

Register of New Patents.

1262.—JAMES ANTHONY EMSLIE, of Tarbert, in the co. of Argyll, gentleman, and JAMES THOMAS EMSLIE, of North Shields, in the co. of Northumberland, engineer, for "*Improvements in apparatus for lifting, forcing, or conducting liquids, gases, or air.*" Provisional protection only obtained. Dated May 3, 1870.

These improvements consist in the employment for the above purposes of any convenient pneumatic apparatus attached to, and working in connexion with, suitable air and water pipes or tubes furnished with convenient valves, by means of which liquids or liquid substances, such as mud, and so forth, may be readily sucked or forced up, without such liquids or liquid substances coming in contact with and fouling the working parts of the machinery, as is generally the case with the pumps commonly in use; also when desired and necessary in furnishing suitable lift-boxes, tanks, or receivers, placed at convenient altitudes (about every 30 feet), for the purposes of temporarily receiving the liquid or air therein, such boxes or tanks being in connexion with the tubes above mentioned, and worked alternately.

1274.—WILLIAM WOODWARD and ADAM WOODWARD, jun., of the city of Manchester, in the co. of Lancaster, engineers, for "*Improvements in apparatus or arrangements to be used in connexion with retorts for the manufacture of gas.*" Provisional protection only obtained. Dated May 4, 1870.

These improvements consist in arrangements by which the draught from the chimney, or one produced by a fan, steam-jet, or other means, may be caused to suck and draw away the said smoke, dust, and other matters. It is preferred to carry out the invention by a fixed hood in front of the retorts, or a moveable hood made to traverse on rails in front of the retorts, and arranged so as to be connected by a valve or damper with a suitable pipe or channel communicating with the chimney.

1285.—JOSEPH BRYAN HICKMOTT, of Carlisle, in the co. of Cumberland, engineer, for "*Improvements in the manufacture of gas and coke, and in the apparatus to be employed in the same manufacture.*" Provisional protection only obtained. Dated May 6, 1870.

In carrying out this invention it is proposed to construct in the sides of the retort or generator a number of vertical channels or flues communicating with the interior of the retort or generator by means of narrow vertical slits or openings, which, by reason of their small dimensions, will not admit of any appreciable quantity of coal into the channels or flues, but readily allow the gas as it generates to pass into the said channels or flues, and thence into the vacant space in the top of the retort above the coal, whence it will be conveyed in the usual manner by means of a pipe to the condensing apparatus.

1295.—ABRAHAM RIPLEY, of 34, West Square, St. George's Road, Southwark, in the co. of Surrey, engineer, for "*A new or improved pipe-wrench.*" Patent dated May 6, 1870.

This improved pipe-wrench consists of a fixed head-check or boss formed on one end of an ordinary lever or shank. The head-check or boss has a curved aperture forming a mouth with jaws, one of which (the one having the concave inner surface) is provided with teeth, by preference ratchet shaped, with their square surface facing inwards, whilst the inner convex surface of the other jaw is left smooth.

1300.—EDWARD THOMAS KIRKPATRICK, of Brussels, in the kingdom of Belgium, doctor of natural science, for "*A new or improved mode of producing oxygen gas at the ordinary temperature of the air, or at a higher temperature.*" Patent dated May 6, 1870.

This improved mode of producing oxygen gas consists in the addition of hydrated oxide or any hydrated salt or other hydrated compound of cobalt or nickel, or any mixture of these substances in a comparatively small proportion to any soluble hypochlorite, such as hypochlorites of lime, of potassa, of soda, of baryta, or of magnesia (commonly known as chlorides of lime, of potassa, of soda, of baryta, or of magnesia). This compound of these compounds of cobalt or nickel coming in contact with the hypochlorite or hypochlorites are decomposed, giving rise to a black precipitate or superoxide in a hydrated state, which precipitate acting on the hypochlorite (or chloride of oxide) sets free the oxygen contained in it. The oxygen gas thus set free escapes with effervescence, and may be collected in the same manner as hydrogen or carbonic acid gases in a reservoir or gasometer.

1311.—ROBERT WEARE, of Newcastle-under-Lyme, in the co. of Stafford, sanitary contractor, for "*Improvements in apparatus for receiving and treating sewage and other noxious matters.*" Patent dated May 7, 1870.

According to this invention, it is proposed in order to free sewage from foul matter, so as to render the liquid innocuous, and obtain from the sewage a valuable manure, to cause it to be discharged, after it has passed through a catch-pit where stones and sands are deposited, to enter a double tank, the inner sides of which are perforated, and enclose and retain filtering materials. The liquid part of the sewage percolates through these materials from the interior of the tank to the outer perforated walls or sides, and escapes into succeeding filtering-vessels, and so to the outfall, whilst the solid part of the sewage remains within the first tank. The filtering materials employed are charcoal and washed cinders. The former being reduced to the size of swan-shot, or thereabouts.

1314.—ASTLEY PASTON PRICE, of 47, Lincoln's Inn Fields, in the co. of Middlesex, consulting chemist, for "*Improvements in the treatment of sewage, and in the production of manures.*" Patent dated May 7, 1870.

This improved mode of treating sewage consists in submitting to the action of an acid or acids, such for example, as sulphuric or hydrochloric acid or of mixtures of the same, any of the natural phosphates or mixtures of them, and having converted such phosphates as are capable of being rendered soluble by the action of the acids into a soluble form, to employ the same or a solution thereof in the following manner:—Whilst the sewage is contained in a cistern or reservoir, or whilst it is in the act of flowing thereinto, the requisite proportion of the soluble phosphates is to be added thereto, and after thorough admixture with the sewage by the use of agitators or other well-known means, the sewage so treated may be allowed to remain tranquil in the reservoir, in order that subsidence of the resulting precipitate may be effected, or after having added to the sewage the requisite amount of the soluble phosphate a base, such, for example, as lime (by preference in the form of milk of lime), is to be added in such quantity as that the phosphates in solution shall be precipitated.

1329.—BERNARD HIPPOLYTE CHAMEROY, of the city of Brussels, in the kingdom of Belgium, mechanician, for "*Improvements in cocks.*" Patent dated May 10, 1870.

This invention consists in new arrangements and apparatus for obtaining an intermittent flow of fluids, and whereby the misappropriation and waste of water in cities or in establishments in which water has to be distributed is prevented, and considerable profit obtained from the saving effected, and from the prevention of the flooding of buildings and the bursting of pipes—accidents which frequently occur with the apparatus ordinarily in use. The details are not given apart from the drawings.

1335.—WILLIAM ROBERT LAKE, of Southampton Buildings, London, consulting engineer, for "*Improvements in apparatus or machinery for making gas from liquid hydrocarbons for illuminating purposes.*" A communication. Patent dated May 10, 1870.

The liquid employed is hydrocarbon, that is easily evaporated and known as gasoline, the same is introduced in a vessel, from which a pipe leads to the evaporating apparatus. If the gasoline vessel is below the evaporating vessel, a pressure is produced therein above the gasoline by compressed air or gas. The evaporating vessel is heated by artificial heat, and vaporizes the liquid hydrocarbon, the surplus pressure in the evaporating vessel forces the gasoline back into its vessel, and hence away from the heat, and checks the formation of gas. The heat employed is from a steam-jacket, in cases where that can be easily obtained, such as on locomotive head-lights, or from gas generated in the apparatus itself, and burned beneath the evaporating vessel. When the latter mode of heating is employed, a receptacle is provided for a small quantity of alcohol or gasoline to be burnt in starting the apparatus to heat the evaporator. The gasoline vapours generated in the evaporator are led to a small nozzle, from which they escape rapidly, in consequence of the pressure, and pass into a pipe leading to a gasholder, and near the nozzle, air is admitted in a regulated quantity, so as to be drawn in by the speed of the issuing gasoline vapour jet, and passes on into the apparatus, the gasoline vapours and atmosphere being thereby mixed and commingled in the proportions necessary to form an illuminating gas that burns with great brilliancy, and is not liable to condense in the pipes leading to the burners. When this apparatus is used with the head-light of a locomotive, or where a steady supply of gas is required, the gas may be led directly to the burners, but in dwellings, factories, or other places where the quantity of gas consumed varies, the gasoline vapours and air are to be passed into a gasholder, formed with a flexible weighted diaphragm, that rises when gas is forced into the said holder, and falls as the gas is forced to the burners. The movement of this diaphragm (with greater or less rapidity according to the gas consumed) is utilized to open and close a valve that allows the jet of gasoline vapour to blow out of the said nozzle and replenish the gasholder, and the movement of the diaphragm, as the gasholder becomes full, closes the said valve to shut off the supply until the valve is again opened by the descent of said diaphragm. When the apparatus is stopped by shutting off the heat, the cooling of the evaporating vessel is made to operate a prop that holds up the diaphragm, so that it will not descend to open the gasoline vapour valve, hence the apparatus remains ready for future use, and the heating of the evaporator in starting removes this prop, so that the operations are automatic.

APPLICATIONS FOR LETTERS PATENT.

489.—WILLIAM JACKSON, of the city of Norwich, in the co. of Norfolk, engineer, for "*Improvements in equilibrium pumps and turbines.*" Feb. 24, 1871.

490.—JOHN LOWTHIAN, of 38, Lowther Street, Carlisle, in the co. of Cumberland, for "*Improvements in water-flushing apparatus.*" Feb. 24, 1871.

520.—ARTHUR AUCKLAND COCHRANE, of the city of Westminster, in the co. of Middlesex, gentleman, for "*Improvements in the application of bituminous compositions for sanitary and other useful purposes.*" Feb. 27, 1871.

531.—ALGERNON GUTHRIE and JAMES STEVENSON, of Gravesend, in the co. of Kent, for "*Improvements in motive-power engines, pumps, and meters.*" Feb. 27, 1871.

535.—JOSEPH TRUSWELL and WILLIAM TRUSWELL, both of Sheffield, in the co. of York, engineers, for "*An improved apparatus or means to be employed for heating air for warming rooms, apartments, buildings, or parts of same, and for other purposes of a similar nature.*" Feb. 28, 1871.

543.—ANDREW AINSLIE COMMON, of South Bank, Regent's Park, in the co. of Middlesex, engineer, for "*A new or improved automatic apparatus for opening and closing cocks, taps, or valves.*" March 1, 1871.

556.—JAMES BANNEHR, of Great Queen Street, in the city of Westminster, and HENRY MATTHEWS, of Gower Street, in the co. of Middlesex, for "*Improvements in treating coal for the manufacture of gas and fuel therefrom.*" March 2, 1871.

572.—CHARLES FORSTER COTTERILL, of Cannock, in the co. of Stafford, gentleman, and GEORGE BIDDLE, of Cannock aforesaid, plumber, for "*Improvements in attaching taps or stop-cocks to water, gas, steam, and other pipes for making connexions therewith, and in apparatus to be employed for that purpose.*" March 3, 1871.

576.—JOHN DUNKLEY, of Adelaide Villas, Park Road, Teddington, in the co. of Middlesex, builder, for "*Improvements in sewers and the treatment and distribution of sewage manure.*" March 3, 1871.

595.—ARNOLD BUDENBERG, of the firm of Schaffer and Budenberg, of Lower King Street, in the city of Manchester, in the co. of Lancaster, for "*Improvements in pumps.*" A communication. March 6, 1871.

596.—JOHN HORTON, of 620, Broadway, New York, U.S.A., but at present residing at 113, Hagley Road, Edgbaston, in the co. of Warwick, manufacturer, for "*Improvements in gaseliers, sliding gas-pendants, and sliding gas-brackets.*" March 6, 1871.

619.—WILLIAM GEORGE CANNON, of 52, New Kent Road, in the co. of Surrey, for "*An improvement in gas, steam, or water cocks.*" March 8, 1871.

GRANTS OF PROVISIONAL PROTECTION.

351.—CHARLES BALY, of Gray's Inn, in the co. of Middlesex, gentleman, for "*Improvements in the chemical means, apparatus, and machinery employed in deodorizing, disinfecting, and converting into superior manure the sewage and other fœcal matters, whether human, animal, vegetable, solid, or liquid, or the blood of animals, or other refuse matters derived from various sources.*" A communication. Feb. 10, 1871.

379.—HECTOR CLAUSE, of Rue de Bretagne, Paris, temporarily resident at Hatton Garden, in the co. of Middlesex, watch and clock manufacturer, for "*Improvements in taps or valves for gas, water, and other fluids.*" Feb. 15, 1871.

426.—ALFRED WILLMER POCOCK, of Pimlico, in the co. of Middlesex, engineer, for "*Improvements in liquid-meters.*" Feb. 17, 1871.

443.—GEORGE EVELEIGH, of 16, Asylum Road, Peckham, in the co. of Surrey, consulting chemist, for "*Improvements in the manufacture and purification of gas, and in certain parts of the apparatus employed therein.*" Feb. 21, 1871.

452.—GEORGE HASELTINE, of Southampton Buildings, London, for "*An improved method of and apparatus for carburetting atmospheric air.*" A communication. Feb. 21, 1871.

469.—WILLIAM ALFRED TELLING, of 49, Wellgate, Rotherham, in the co. of York, gas-meter maker, and SAMUEL JOHNSON, of 18, Clifton Bank, Rotherham, in the co. of York, draughtsman, for "*Improvements in the construction of dry gas-meters.*" Feb. 22, 1871.

474.—ROBERT HEYWORTH, of the city of Manchester, plumber and sanitary engineer, for "*Improvements in apparatus for supplying water to wash-basins, and for flushing water-closets and urinals.*" Feb. 23, 1871.

475.—GEORGE HASELTINE, of Southampton Buildings, London, for "*Improvements in gas-burners.*" A communication. Feb. 23, 1871.

484.—WILLIAM MORRIS the younger, of Kent Water-Works, Deptford, in the co. of Kent, engineer, for "*Improvements in apparatus for regulating and controlling the supply of water for domestic and other purposes.*" Feb. 23, 1871.

490.—JOHN LOWTHIAN, of 38, Lowther Street, Carlisle, in the co. of Cumberland, for "*Improvements in water-flushing apparatus.*" Feb. 24, 1871.

520.—ARTHUR AUCKLAND COCHRANE, of the city of Westminster, in the co. of Middlesex, gentleman, for "*Improvements in the application of bituminous compositions for sanitary and other useful purposes.*" Feb. 27, 1871.

NOTICES TO PROCEED.

2752.—GEORGE GEORGE, of Liverpool, in the co. of Lancaster, gas engineer, for "*Improvements in numerical registering and indicating apparatus.*" Oct. 19, 1870.

2826.—WILLIAM ROSS, of Glasgow, in the co. of Lanark, N.B., brassfounder, for "*Improvements in and relating to ball-valves and floats.*" Oct. 27, 1870.

3228.—WILLIAM LLOYD WISE, of Chandos Chambers, Adelphi, in the city of Westminster, patent agent, for "*Improvements in the mode of and apparatus for igniting gas.*" A communication. Dec. 8, 1870.

3304.—SYDNEY SMITH, of Hyson Green Brass-Works, near Nottingham, brassfounder, for "*Improvements in cocks and valves.*" Dec. 17, 1870.

3325.—ALBERT MARCIUS SILBER, of Wood Street, Cheapside, in the City of London, merchant, for "*Improvements in apparatus for lighting and heating purposes.*" Dec. 20, 1870.

53.—THOMAS GOODE MESSENGER, of Loughborough, in the co. of Leicester, hydraulic engineer, valve manufacturer, and horticultural builder, for "*Improvements in the coupling of pipes.*" Jan. 10, 1871.

164.—ALEXANDER KIRK RIDER, of the city of New York, in the state of New York, U.S.A., for "*Improvements in air and gas engines.*" Jan. 21, 1871.

426.—ALFRED WILLMER POCOCK, of Pimlico, in the co. of Middlesex, engineer, for "*Improvements in liquid-meters.*" Feb. 17, 1871.

452.—GEORGE HASELTINE, of Southampton Buildings, London, for "*An improved method of and apparatus for carburetting atmospheric air.*" A communication. Feb. 21, 1871.

Share List of Metropolitan Gas Companies.

Number of Shares issued.	Amount per Share.	Name of Company.	Amount paid up p. Share.	Dividend p. Cent. p. Annum.	Latest Quotations.
	£		£ s. d.	£ s. d.	£
8000	10	Anglo-Romano	10 0 0	10 0 0	
5000	20	Bahia (Limited)	20 0 0	3 0 0	13 — 14
1000	20	Do., preference	20 0 0	10 0 0	25 — 26
750	20	Do., do., redeemable	20 0 0	10 0 0	20 — 22
40000	5	Bombay (Limited)	5 0 0	4 10 0	6⅞ — 7⅛
10000	5	Do., third issue	4 0 0	4 10 0	1¼—⅜ pm.
10000	20	British (Limited) (Norwich, Hull-Sculcoates, Hanley, Tunstall & Shelton [Potteries], Trowbdge., & Holywll.)	20 0 0	10 0 0	31 — 33
7500	20	Cagliari (Limited)	20 0 0	7 0 0	
112000	10	*Chartered*	10 0 0	9 0 0	15⅞— 16⅛
10000	10	Do., B shares, 4 per cent. max.	10 0 0	4 0 0	7 — 7⅛
25000	10	Do., 5 per cent. preference	10 0 0	5 0 0	12⅞— 13⅛
20000	10	Do., 10 per cent. preference	10 0 0	10 0 0	19¼— 20
17490	25	*Commercial*	25 0 0	10 0 0	42 — 44
20000	20	Continental Union	20 0 0	8 0 0	25½— 26
10000	20	Do., new	7 10 0	8 0 0	2¼—3¼ pm.
5213	20	Do., preference (France: Strasbg., Cette, Nismes, Montargis, Vienne, Roanne, Beaucaire, Rueil, Albi. Italy: Milan, Genoa, Parma, Modena, Alessandria, Messina.)	20 0 0	7 0 0	25 — 27
5000	10	*Crystal Palace District*	10 0 0	10 0 0	16 — 17
5000	10	Do., preference	10 0 0	6 0 0	11 — 12
6044	10	Do., new shares	10 0 0	7 0 0	11 — 12
3956	10	Do.	1 0 0	7 0 0	.. — 1¼
4000	50	*Equitable*	50 0 0	10 0 0	90 — 92
4000	25	Do., new shares	25 0 0	10 0 0	44 — 46
23406	10	European (Limited)	10 0 0	11 0 0	15⅞ — 16¼
12000	10	Do., new shares (Boulogne, Amiens, Rouen, Caen, Havre, & Nantes.)	5 0 0	11 0 0	3 — 3½
5000	10	Hong Kong (Limited)	10 0 0	9 0 0	11 — 12
26000	50	*Imperial*	50 0 0	10 0 0	84 — 86
26000	10	Do., new shares	10 0 0	10 0 0	16⅞ — 17¼
26000	12½	Do., new shares	12 10 0	7 0 0	15½ — 16¼
25000	12½	Do., new shares, 1870	5 0 0	7 0 0	2—2¼ pm.
1300	100	Do., bonds	£100	10 0 0	170 —175
56000	50	*Imperial Continental* (Amsterdam, Berlin, Ghent, Hanover, Lille, Rotterdam., Aix-la-Chapelle, Antwerp, Bordeaux, Brussels, Cologne, Frankfort-on-Maine, Haarlem, Stolberg, Toulouse, & Vienna.)	43 15 0	9 2 6	66 — 68
400	100	Imperial Mexican (Limited)	100 0 0	nil.	
200	100	Do., new	100 0 0	nil.	
3000	40	*Independent*	40 0 0	10 0 0	67 — 69
3000	10	Do.	10 0 0	5 0 0	7⅛— 8¼
3000	20	Do.	17 0 0	7 10 0	3 — 4 pm.
7133	50	*London*	50 0 0	10 0 0	85 — 87
5610	25	Do., 1st preference	25 0 0	6 0 0	28¼ — 29½
503	50	Do., 2nd preference	50 0 0	6 0 0	
214	50	Do., 3rd preference	50 0 0	6 0 0	
£18781		Do., 1st preference stock		6 0 0	
£11828		Do., 2nd preference stock		5 0 0	
15000	5	Nictheroy, Brazil (Limited) Malta and Mediterranean (Limited)	5 0 0	4 10 0	3⅞ — 4¼
6000	5	Do., preference	5 0 0	7 0 0	4⅞ — 5¼
20000	5	Mauritius (Limited)	2 0 0		2 — 2¼
30000	5	Oriental (Calcutta)	5 0 0	10 0 0	8 — 8½
30000	5	Do., new shares	2 10 0	10 0 0	1¼—2 pm.
10000	5	Ottoman (Limited)	5 0 0	nil.	2 — 2¼
14000	10	Park (Limited)	10 0 0	10 0 0	10 — 11
27000	20	*Phœnix*	20 0 0	10 0 0	34 — 35
3600	100	Do., new	40 0 0	7 10 0	53 — 55
144000	8k.	Do.	100 0 0	5 0 0	88 — 90
5000	20	*Ratcliff*	20 0 0	10 0 0	32½— 33½
	20	Rio de Janeiro (Limited)	20 0 0	10 0 0	28½ — 29⅝
6959	5	Singapore (Limited)	5 0 0	7 0 0	
2000	5	Do., preference	5 0 0	7 10 0	
1500	32½	Shanghai	32 10 0	12 0 0	
4000	50	*South Metropolitan*	50 0 0	10 0 0	89 — 91
4000	12½	Do.	12 10 0	10 0 0	21½— 22½
20000	12½	Do., new shares	2 10 0	10 0 0	5—6 pm.
15000	10	*Surrey Consumers*	10 0 0	10 0 0	16 — 17
10000	10	Do., new	6 0 0	10 0 0	4½—5¼ pm.
9000	4	United General (Limerick)	4 0 0	5 0 0	2⅜— 2⅝
1500	10	*Wandsworth and Putney*	10 0 0	10 0 0	10 — 12
1500	10	Do.	10 0 0	7 10 0	
1819	10	Do.	10 0 0	7 10 0	
1138	10	Do.	5 0 0	7 10 0	
20000	10	Western (Limited) A shares	10 0 0	10 0 0	17 — 18
10000	10	Do., B shares	9 0 0	10 0 0	6 —7 pm.
10000	10	Do., C shares	9 0 0	10 0 0	6 —7 pm.
20000	10	Do., D shares	1 0 0	10 0 0	2¾—3 pm.
16000	5	*West Ham*	5 0 0	8 0 0	6¾— 7
10000	5	Do., new shares	1 0 0	8 0 0	1¼— 1½
551	10	West London Junction (Limited)	10 0 0	6 0 0	
520	10	Do., preference	10 0 0	6 0 0	

Price Current.

CASTINGS.—*Per Ton.*

Average Weight of Cast-iron Gas-pipes, per Yard.

1 in.	2 in.	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lb.

Retail Prices are 5 to 10 per cent. higher.	London.	Glasgow.	Newcastle and Middlesboro'.	Wales.	Yorkshire, Derbyshire, and Staffordshire.
	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.
Pig Iron, No. 1 (g.m.b.)	3 15 0	2 13 0	2 10 0	3 10 0	3 15 0
1¼ and 2-inch Socket-pipes	7 0 0	5 15 0	5 10 0	6 0 0	7 0 0
2½ and 3-inch ditto	6 10 0	5 5 0	5 0 0	5 15 0	6 10 0
4 and 5-inch ditto	6 0 0	4 15 0	4 10 0	5 5 0	6 0 0
6 inches and upwards ditto	5 15 0	4 5 0	4 0 0	5* 0 0	5 15 0
Retorts, 1st fusion, hot blast	5 10 0	4 10 0	4 5 0	5 0 0	5 10 0
Ditto, 2nd ditto, cold ditto	6 10 0	—	—	—	6 10 0
Tank-plates, ¼ thick and above	6 0 0	5 0 0	4 15 0	5 10 0	6 0 0

WROUGHT-IRON TUBING,

Subject to 60 per cent. Discount.

	2 in.	1¼ in.	1½ in.	1 in.	¾ in.	½ in.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Patent Welded Tubes, from 2 to 14 feet—per foot	1 8	1 1	0 10	0 7	0 5	0 4½
Ditto ditto, from 12 in. to 23½ in.—each	3 0	2 0	1 6	1 1	0 9	0 8
Long Screws, from 12 in. upwards	4 0	2 3	2 0	1 6	1 2	0 11
Bends and Springs	4 3	2 3	1 9	1 3	0 11	0 8
Square Elbows, equal or reducing; Round Elbows, 5 per cent. extra	3 9	2 3	1 9	1 3	0 10	0 8
Tees, wrought or cast	4 0	2 6	2 0	1 6	1 1	0 9
Crosses, ditto, equal or reducing	4 9	3 6	3 0	2 3	1 9	1 6
Iron Cocks	20 9	13 0	10 0	7 3	5 0	3 8
Ditto, with brass plug	28 0	16 0	13 0	7 0	5 6	4 6
Diminishing Sockets, Caps, Plugs, and Nippies	1 3	0 9	0 8	0 6	0 5	0 4½
Plain Sockets	1 0	0 8	0 7	0 5	0 4	0 3
Syphons, 2-quart	15 0	14 0	13 6	13 0	12 0	—

FREIGHTS.

Coastwise—Newcastle:—	Per Ton.
Chatham and Rochester	6s. 9d
Cork	—
Dover, Folkestone, and Ramsgate	7 0
Dublin	8 9
Exeter Quay	8 6
Ipswich	6 0
London (from Leith)	6 6
London (Pool)	6 3
Lowestoft and Yarmouth	5 6
Portsmouth & Southampton	7 6
Plymouth	8 3
Shoreham	7 3
Whitstable	7 0
Weymouth	8 3

Foreign:—	Per Keel.
Barcelona	£19 0s
Bordeaux	9 0
Boulogne and Calais	7 0
Cadiz	10 0
Cronstadt	10 0
Copenhagen	8 0
Genoa	17 10
Hamburg	8 10
Havre de Grace	7 15
Leghorn	17 15
Lisbon	9 10
Rotterdam	7 10
Stettin	10 0
Trieste	19 0
Venice	20 0

GAS COALS.

Newcastle—Unscreened:—	Per Ton.
Haswells, Nettlesworth Primrose, and South Pelaw	6s. 6d.
Felling, Framwell Gate, North Pelton, Redheugh Main, Walker's Primrose, West Wear, and Whitwell Primrose	7 6
Burnhope, Craghead, Charlaw, Derwent, East Castle, Edmondsley, Eighton Moor, Hartlepool Pelaw, Holmside, Lambton's Gas, Lanchester Pelaw, Medomsley, Mickley, New Pelaw, Pelaw Main, Ravensworth, Seaham, South Moor Pelton, South Leverson, Townley Main, Tyne Main, West Pelaw, Wearmouth Hutton, and Witton	7 0
Peareth, Ravensworth Pelaw, Waldridge, West Garesfield, and West Pelton	7 3
Brancepeth, Dean's Primrose, Londonderry Gas, New Pelton, Pelton, South Peareth, Stella, Urpeth, Washington Hutton, and West Leverson	7 6
Ramsay's Newcastle Cannel	17 6
Wigan Cannel (at Liverpool)	17 0
Welsh Cannel:—	
Coppa Cannel (on rails at Birkenhead), 13s. 6d.; ditto (on rails at Connah's Quay)	13 0

Scotch Cannel, f.o.b.:—	Per Ton.	*Scotch Cannel*, f.o.b.:—	Per Ton.
Boghead—at Bo'ness, 47s. 6d.; at Leith	48s. 2d	Arniston (at Leith)	21s. 0d
Muirkirk	27 0	Wemyss (at Wemyss)	20 0
Kirkness, best (at Burntisland)	22 6	Haywood Co.'s Haywood (at Granton)	20 0
Capeldrae, 1st quality (at ditto)	22 6	Pirnie, or Methill	17 0
Ditto, 2nd ditto (at ditto)	17 6	Lothian's Cannel (at Leith)	24 6
Cowdenbeath (at ditto)	12 0	Grange ditto (at Bridgeness)	17 6
Lochgelly (at ditto)	12 0	Kinniel ditto (at Bo'ness)	17 6
Donnibristle—at Burntisland, 12s.; at Aberdour	12 6	Myles' ditto	23 6
Auchinheath Lesmahago (at Granton)	27 0	Lochore Parrot (at Burntisland)	22 6
Duke of Hamilton's Lesmahago (at Granton)	27 0	Lanemark (at Glasgow)	16 0
		Elphinstone Tower (at Leith)	20 0

SUNDRIES.

Best Newcastle Fire-bricks, per 1000	£2 10s. to £2 15s. 0d.
Cliff's Fire-bricks (at Wortley), per 1000	2 15 6
Ingham's ditto (at Wortley), per 1000	2 15 0
Farnley Iron Co.'s Fire-bricks (at Wortley), less discount	2 17 0
Fire-clay Retorts, per foot run	5s. 6d. to 0 7 6
Tarred Rope Yarn, per cwt.	1 0 0

THE

DUKE OF HAMILTON'S

LESMAHAGOW

CANNEL COAL.

LESSEES:

THE NITSHILL & LESMAHAGOW COAL COMPANY.

OFFICE:

37, ST. VINCENT PLACE,

GLASGOW,

Where all communications are requested to be addressed.

FLETCHER, SPECK, & CO.,

CONTRACTING GAS ENGINEERS, IRON & BRASS FOUNDERS,

GLENGALL IRON-WORKS, **MILLWALL, LONDON, E.,** and RATCLIFF FOUNDRY, **COMMERCIAL ROAD EAST, LONDON, E.,**

MANUFACTURERS OF

TELESCOPIC and **SINGLE GASHOLDERS, TANKS, PURIFIERS, CONDENSERS,** and every description of **GAS-MAKING APPARATUS. IRON MAIN-PIPES** supplied and laid. **RETORTS, MOUTHPIECES, CROSS-BARS, RETORT-LIDS, VALVES, WROUGHT-IRON TUBES,** and **FITTINGS.** Wrought and Cast Iron Hydraulic Mains. **LAMP-POSTS, COLUMNS, GIRDERS, BRIDGES,** &c.

CORRUGATED IRON ROOFS & BUILDINGS.

Coke Barrows, Shovels, Scoops, Bolts & Nuts, Cotters, &c., kept in Stock.

WANTED, a steady, respectable married Man, who thoroughly understands the manufacture of gas, and is competent to take the GENERAL MANAGEMENT of a small gas establishment.

Applications to be made in writing, stating age, qualifications, and testimonials, to W. P. B., 82, Southtown, Yarmouth, NORFOLK.

PURIFIERS WANTED.

WANTED, by the Clayton, Allerton, and Thornton Gas Company, a set of second-hand DRY LIME PURIFIERS, not less than 10 or 12 ft. square, in good condition.

Apply, stating price and particulars, to JOHN NIVEN, Manager, Gas-Works, Clayton, near BRADFORD.

March 10, 1871.

WANTED, an engagement as Manager, or SECRETARY and MANAGER, to a Gas Company. The Advertiser has had over 12 years experience in the management of Gas-Works and gas accounts.

Address X. A. B., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Advertiser, re-employ-ment on a Gas-Work. Understands the manufacture and distribution of gas, fitting, &c., book-keeping and collecting, and would make himself useful. Excellent testimonials.

Address H. N. H., care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, immediately, by an active, energetic young Man, a situation as Meter Fitter and Repairer, Meter Inspector, or Collector in a Gas-Work, having filled a similar situation. Can produce first-class testimonials.

Address J. M., 8, Great Avenham Street, Preston, LANCASHIRE.

WANTED, by the Advertiser, a situa-tion as FITTER, or to repair, fix, or prove gas-meters. Town or country.

Address G. J., 65, Allscot Road, Grange Road, BERMONDSEY.

WANTED, in three months, a Manager for a Gas-Work where the production is 4,000,000 feet per annum. Applicants must possess a practical knowledge of carbonization, retort-setting, main-laying, and general fitting. A house, with coal, gas, and water, attached.

Apply to the Whitchurch and Dodington Gaslight and Coke Company, Whitchurch, SALOP, enclosing copy of testimonials, age, qualifications, &c., with salary required.

FOR SALE, Several Volumes of this JOURNAL, bound in cloth and lettered; 3s. 6d. per volume.

Apply to T. H. BOUTTELL, Gas-Works, SLEAFORD.

STATION-METER.

FOR SALE, a Station-Meter to pass 15,000 cubic ft. per hour, in a handsome square case; made in 1854.

For particulars, apply to JOHN EUNSON, Gas-Works, NORTHAMPTON.

ON SALE, Six Gasholder Columns, 22 ft. long, with suspension carriages and pulleys.

For particulars, apply to J. R. SMITH, Gas-Works, Padiham, LANCASHIRE.

TAR.

THE Directors of the Cambridge Uni-versity and Town Gaslight Company are open to receive OFFERS for their produce of TAR, particulars of which may be had from W. WOOD, Manager.

FOR SALE, CHEAP, Two Cast-iron GASHOLDER-TANKS, second hand; one 51½ ft. diameter by 26 ft. deep, and one 41½ ft. diameter by 20 ft. deep. These having stood above ground, covered in, are as good as new, being complete with strong malleable binders.

Apply to MILLER AND CO., Ironfounders, EDINBURGH.

PURIFIERS.

ON SALE.—Purifiers in Stock, 5 ft. by 2 ft. 6 in., 6 ft. by 3 ft., 6 ft. by 4 ft., 6 ft. by 6 ft., 8 ft. by 8 ft., 10 ft. by 10 ft., with or without wood, cast-iron, or wrought-iron grids.

Further particulars to W. C. HOLMES AND CO., HUDDERSFIELD.

TO BE SOLD, 2 dry lime Purifiers, 8 ft. square by 3 ft. 2 in. deep. Lutings 18 in. dip.

Two Wrought-Iron Covers for same.

One Lifting Crane, one Centre-Valve, with 10-in. connexions, and can work 1, 2, or 3 Purifiers at one time.

Also Four Dry Lime Purifiers, 4 ft. square by 3 ft. deep, with riddles, lifting gear, centre-valve, with 6-in. connexions, all complete and in excellent working order.

For view, price, &c., apply to the MANAGER, Elsecar Gas-Works, BARNSLEY.

TO BE SOLD, at the Rhyl Gas-Works, North Wales, 23 15-in. Mouthpieces for Clay Retorts, ascension-pipes, hydraulic main, and delivery pipes complete. One set of 8-in. double vertical Condensers. One Station-Meter (Bent and Co.), with valves and connexions complete, to pass 4000 feet per hour. Four sets of Purifiers, respectively 6 ft. by 3 ft. 6 in., 4 ft. by 5 ft., 4 ft. by 4 ft., with connexions, &c., complete. Large lot of cast and wrought iron, comprising the interior Fittings of a 10,000 feet Gasholder; and sundry other materials.

Applications to MILES R. FARTINGTON, Secretary, Gas Company, Limited, RHYL.

RHOS GAS-WORKS, NEAR WREXHAM.

TO BE SOLD by Auction, by Messrs. Baugh and Jones, at the Wynnstay Arms, Wrexham, in the county of Denbigh, on TUESDAY, the 11th day of April, 1871, at Three o'clock in the Afternoon (unless previously disposed of by Private Contract, of which due notice will be given), subject to such conditions as will be produced at the time and place of sale, the RHOS GAS-WORKS, situate at Rhosllanerchrugog, near Wrexham, in the county of Denbigh, with all the Freehold Land, Buildings, Plant, Retorts, Condensers, Purifiers, Gasholders, Station-Meters, Main-Pipes, and Meter Service-Pipes now in use, supplying the town of Rhos and its neighbourhood with Gas; and all other the implements and utensils of manufacture, machinery, tools, fitters, cranes, gear, tackle, and other the appurtenances thereto.

For further information and particulars, apply to Messrs. W. C. Holmes and Co., 57, Gracechurch Street, London; to Messrs. Baugh and Jones, Auctioneers, Wrexham; or to Messrs. Learoyd and Learoyd, Solicitors, 11, South Street, Finsbury, London, E.C.; or at their Offices, Buxton Road, Huddersfield.

TO GAS COMPANIES AND OTHERS.

THE London and North-Western Railway Company OFFER for SALE the following GAS APPARATUS:—

One Gasholder, 30 ft. diameter, 14 ft. high, with four cast-iron columns, 7 in. diameter, with balance-weights and valves. One ring of stone coping for ditto.
One Gasholder, 30 ft. diameter, 14 ft. high, with three cast-iron columns, 7½ in. diameter, with balance-weights and valves. One ring of stone coping for ditto.
One cast-iron Station-Meter, with valve and bye-pass.
One do. Travelling Crab for lifting purifier tops.
Two do. lengths of Hydraulic Main, 16 in. diameter.
Nine do. 5-in. Stand-Pipes.
Fifteen do. Arch-Pipe Connexions.
Nine do. D-shaped Retort Mouthpieces, 17½ in. by 13 in.
Thirteen do. Wall-Plates, 10 ft. 4 in. by 8 in.
Fourteen do. Retort-Lids; and nine wrought-iron Cross-Bars, with square threads for ditto.

The whole of the Apparatus is in fair condition, and may be seen on application at the Locomotive Superintendent's Office, Crewe Works, where any further particulars may be obtained.

Crewe, March 11, 1871.

TO GAS COMPANIES AND OTHERS.

THE Directors of the Wrexham Gas Company have for DISPOSAL (on account of removing to a new site, and erecting larger plant), small Horizontal Engine, working exhauster; Perpendicular Engine, 4-horse power, for pumping water, tar, &c., &c., with boiler 5 ft. by 2 ft. Lifting Force-Pump, with 4-in. cylinder, for water; two Double-Action Pumps for ammonia water. Exhauster, Beale's (nearly new), with 6-in. valves, bye-pass, &c., to pass 10,000 cubic feet per hour, with regulator and valve. Condensers, 10-in. pipes, 18 ft. high, two rows, 6 in. each, with Donkin's slide-valves. Scrubber, 4 ft. diameter, 18 ft. high, with Anderson's four-way valve. Three valves, Donkin's. Four Dry Lime Purifiers, 6 ft. square, with 78 wrought-iron sieves (20 new), with valves and lifting apparatus. Governor, 10 in. in, 12 in. out. Valves (Donkin's), 2 ft. 4 in., 2 ft. 6 in., 3 ft. 8 in., 1 ft. 10 in., 1 ft. 12 in. The part of the above plant is now in work.

Further particulars may be obtained on application to the undersigned. J. T. Hall, Engineer to the Company.

Wrexham, Feb 22, 1871.

THE Directors of the Shrewsbury Gas Company have for DISPOSAL an elegant 16-light CHANDELIER.

The design is one of Messrs. R. W. Winfield and Co.'s, Birmingham, and admirably suited for a public building. The original cost was £75.

Further particulars may be had on applying to me,

S. B. Darwin, Secretary.

THE Bromsgrove Gas Consumers Company, Limited, have for DISPOSAL (either together or separate) a STATION-METER complete, with bye-pass attached thereto, in good condition; will pass 30,000 feet per 24 hours. Also a set of Four PURIFIERS, with hydraulic centre-valve, each purifier 6 feet square by 4 ft. deep, capable of passing 35,000 feet per 24 hours. The above are being disposed of through extensions; are suitable for a small gas-work, and will be at liberty in June next.

Apply to Henry Brewster, Secretary of the Gas Consumers Company, Bromsgrove.

CITY OF CARLISLE.

TO MANUFACTURING CHEMISTS AND OTHERS.

AMMONIACAL LIQUOR.

THE Carlisle Gas Committee are prepared to receive TENDERS for the AMMONIACAL LIQUOR to be produced at their works for One year, from March 31, 1871, to March 31, 1872.

Particulars may be had on application to the Manager of the Works, to whom tenders, endorsed "Tender for Ammoniacal Liquor," are to be delivered on or before the 30th of March, 1871. J. Hepworth, Manager.

Gas-Works, Carlisle, March 1, 1871.

TO GASHOLDER MAKERS.

THE Directors of the Exeter Gaslight and Coke Company are prepared to receive TENDERS for telescoping a GASHOLDER, 100 ft. by 18 ft. 3 in., with the necessary columns, &c., in conformity with plans and specification, which may be seen at the Office of the Company, Exe Island, Exeter.

Sealed tenders, addressed to the Chairman of the Directors, and endorsed "Tender for Gasholder," to be left with the undersigned, on or before Saturday, the 25th inst.

The Directors do not bind themselves to accept the lowest or any tender. Richard Williams, Secretary.

March 11, 1871.

TO SHAREHOLDERS IN GAS COMPANIES AND CAPITALISTS.

THE Proprietors of a valuable Patent for making Gas from ordinary Coal without Cannel giving, independent of its great purity, a larger illuminating power than any now in use, are desirous of finding a Capitalist to introduce it to the public.

The patent has been tested by a celebrated Analytical Chemist and Gas Engineer, whose reports, with full particulars, can be seen daily between One and Three, at the Office of Mr. James Sriers, 5, New Inn, Strand.

COMMERCIAL GAS COMPANY.

NOTICE is hereby given that the next ORDINARY MEETING of the Company will be held at the London Tavern, Bishopsgate Street, in the City of London, on THURSDAY, the 6th day of April next, at Twelve o'clock at Noon, to receive the Report of the Directors, and to declare a Dividend to the 31st day of December last.

The following Directors—viz., Thomas Brushfield, William Christie, and Alexander Thomas Laporte, Esqs.—will go out of office by rotation, and, being eligible, offer themselves for re-election; and the Board of Directors unanimously recommend those gentlemen to the Proprietors for re-election. Edward Marsh, Esq., Auditor, will go out of office by rotation, who, being eligible, has given notice of his intention to offer himself for re-election.

The Books of the Company will be closed for the Transfer of Shares from the 22nd day of March to the 6th day of April now next ensuing.

By the Company's Act of Incorporation, Shareholders can inspect the Books of the Company during one fortnight before and one month after the Meeting.

By order of the Board,

George Jaques, Secretary.

Stepney, March 10, 1871.

PHŒNIX GASLIGHT and COKE COMPANY.

NOTICE is hereby given that the adjourned HALF-YEARLY GENERAL MEETING of PROPRIETORS, holding previous to the 31st of December last £300 paid-up capital and upwards in the said Company, will be held, pursuant to the Act of Incorporation, on WEDNESDAY, the 5th proximo, at Twelve for One o'clock, at the Bridge House Hotel, in the Borough of Southwark, for the purpose of declaring Dividends to the 31st of December last, to elect Directors and Auditors for the ensuing year, and on other business.

The Transfer-Books will be closed on and after the 15th inst., and opened on the 6th proximo.

By order of the Court of Directors,

Isaac Adolphus Crookenden, Secretary.

70, Bankside, London, S.E., March 8, 1871.

SOUTH METROPOLITAN GASLIGHT AND COKE COMPANY.

NOTICE is hereby given that an ORDINARY MEETING of the PROPRIETORS of this Company will be held at the London Tavern, in the City of London, on MONDAY, the 3rd day of April next, at Two o'clock precisely, to receive the Directors Report and the Accounts of the Company for the half year ending the 31st of December last, to declare a Dividend, and to elect a Director in place of Captain Heathorn, R.A., and an Auditor in place of Archibald F. Paull, Esq., who retire from office at this meeting, but, being eligible, offer themselves for re-election.

Any Proprietor holding forty shares, intending to become a candidate for either of these offices, must give notice in writing at the office of the Company, at least fourteen days previously to the day of election.

The Transfer Books of the Company will be closed from the 18th of March to the 3rd of April.—By order,

Thos. Livesey, Secretary.

Old Kent Road, March 11, 1871.

THE SAN PAULO GAS COMPANY, LIMITED.

THE Works of this Company being now in active progress, the Directors are receiving APPLICATIONS for such SHARES as remain unallotted.

The Board has received advice from Brazil to the effect that the Government have increased the number of Public Lights from 500 to 800.

Forms of application for shares can be obtained at the Offices of the Company, Pinners Hall, Great Winchester Street, E.C.

William Richardson, Secretary.

March 13, 1871.

COKE BREEZE.

THE Directors of the Imperial Gaslight and Coke Company are ready to receive TENDERS from parties willing to purchase the BREEZE made at their several works—viz., at York Road, King's Cross; Great Cambridge Street, Hackney Road; and Sand's End, Fulham, for One year, from the 31st inst.

Form of tender may be obtained on application to the Secretary, at the Office, 33, John Street, Bedford Row, to whom the tenders must be sent, on or before Tuesday, the 28th inst.

The Directors will not be bound to accept the highest or any tender.

March 11, 1871.

THE Directors of the Shrewsbury Gas Company are desirous of receiving TENDERS for the surplus TAR and LIQUOR produced at their works, for One, Three, or Five years.

The works adjoin the Shropshire Union Canal and London and North-Western Railway Company's goods yard.

Tenders to state the terms and prices for each article separately, and to be addressed to me on or before the 25th of March next, endorsed "Tender for Tar."

S. B. Darwin, Secretary.

COAL TAR.

THE Directors of the Canterbury Gas and Water Company invite TENDERS for the purchase of their surplus TAR (estimated at 50,000 gallons yearly), for One, Two, or Three years, from the 6th of April next.

The Contractor must remove the Tar at his own expense, as required by the Manager of the Works, and pay for it monthly.

The Directors do not bind themselves to accept the highest tender.

Tenders to be delivered at the Company's Offices, on or before Thursday, the 23rd of March inst.—By order,

James Burch, Secretary.

Secretary's Office, Castle Street, Canterbury, March 10, 1871.

COAL TAR.

THE Newport (Mon.) Gas Company invite TENDERS, at per ton, for the whole or portion of about 300 tons of TAR, now on their works, to be removed by the purchaser during the months of March or April.

The Directors do not bind themselves to accept the highest or any tender. Joseph Bryan, Manager.

Newport (Mon.), Feb. 16, 1871.

BOROUGH OF SALFORD.

TO PIPE MAKERS.

THE Gas Committee of the Borough of Salford is prepared to receive TENDERS for a quantity of 2, 3, and 4 in. cast-iron turned and bored PIPES, particulars of which may be known on application to the Manager, at his Office, Gas-Works, Lamb Lane, Salford.

The Committee does not bind itself to accept the lowest or any tender.

Tenders to be delivered at the Gas-Works, Lamb Lane, on or before the 14th inst., addressed to the Chairman of the Gas Committee, and endorsed "Tender for Pipes."

By order,

Edwin Andrew, Town-Clerk.

Town-Hall, Salford, March 10, 1871.

ALFRED LASS,

ACCOUNTANT.

28, NORTH STREET, WANDSWORTH, S.W.

Mr. Alfred Lass having had considerable experience in arranging, making up, balancing and auditing gas accounts, begs to inform the Directors of Gas Companies that he may be consulted on all matters relating thereto.

Balance-sheets prepared, Accounts audited, Consultations, Agencies, &c.

BOOKS FOR GAS ACCOUNTS.

ALFRED DOUBBLE & Co., 2, Serjeants Inn, and 40, Fleet Street, London, make and supply all the various ACCOUNT-BOOKS as approved and adopted by Accountants, &c., to Gas Companies.

A complete set of the Books and Forms forwarded within a few days from receipt of order.

EDWARD SANDELL, Public Accountant and Auditor, 4, Skinner's Place, Size Lane, London.

The projector of the *Original Gas Companies Analyzed Expenditure Account-Book* offers his experience and services in the examination, preparation, and production of all accounts in reference to Gas Companies. References if required.

CONSULTING GAS ENGINEERS.

MESSRS. GEORGE HEDLEY & CO., 5, George Street, Wolverhampton,

Advise upon PARLIAMENTARY ARBITRATIONS, and all matters connected with Gas.

Plans and Specifications prepared for the Erection and Alteration of Works.

ALFRED PENNY, Gas and Consulting ENGINEER,

Wenlock Iron-Works,

21, WHARF ROAD, CITY ROAD, LONDON.

Mr. Penny having had a large experience in the construction, alteration, and management of Gas-Works, begs to inform the Directors of Gas Companies that he may be consulted on all matters appertaining thereto. He also manufactures Gasholders, Purifiers, and all the various apparatus used in Gas-Works, and keeps in stock Retorts and Mouthpieces, Socket-Pipes, Bends, Branches, and T-pieces, &c., &c.

Plans, Specifications, and Estimates prepared.

NOTICE OF REMOVAL.

MR. H. M. LAYARD JONES, Civil Engineer, has REMOVED from 4, Westminster Chambers, S.W., to 25, Old Broad Street, E.C.

SAMUEL PONTIFEX, Consulting Gas Engineer, having retired from the Great Central Gas Company, is now prepared to furnish PLANS and SPECIFICATIONS, as well as ADVISE Provincial Gas Companies as to the erection of new, or alteration and enlargement of existing works.

Offices: 22, Coleman Street, London, E.C.

MR. ARTHUR SILVERTHORNE, formerly Assistant Engineer to the late Mr. Samuel Hughes, C.E., F.G.S., ADVISES Corporations, Companies, and others, in all matters relating to the Supply of Gas and Water.

Offices: 3, Craven Street, Charing Cross, London, W.C.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT, having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their invention may be secured for Six Months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 42, Parliament Street, Westminster. [Office of the Journal of Gas Lighting, &c.]

EDGE'S PATENT

FOR REMOVING THE

CARBONACEOUS INCRUSTATION FROM GAS-RETORTS.

"*Weymouth Gas-Works, Nov.* 8, 1870.

"Dear Sir,—I am pleased to bear my testimony to the efficiency of Edge's patent process for removing the incrustation from the Retorts. I have had it in use nearly two years, and have no thought of discontinuing it. By this process much labour is saved, and the Retorts are preserved in good working order for a much longer period than formerly, when they were frequently destroyed by the unskilful use of bars. The process is so simple and speedy, that a Retort will make more gas in a given time with a less quantity of fuel.—I am, dear sir, yours faithfully,

"Thomas Stone, Manager.

"E. Goddard, Esq., Ipswich."

For particulars and terms, apply to E. Goddard, Sole Agent, Gas-Works Ipswich.

CATHELS & TERRACE'S Patent Four-WAY DISC GAS-VALVE is the simplest and best Valve for Purifiers, and as a By-pass for other apparatus in Gas-Works. It is always gas-tight, and has no springs, ground faces, or other delicate parts. By its use the flow of the gas cannot be accidentally stopped, and it never sticks.
For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, Foundry and Brass Works, ROTHERHAM.

CATHELS'S Patent District Dry Gas-GOVERNOR is the only perfect self-acting contrivance for Regulating the Pressures in the higher levels of a district.
For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, ROTHERHAM.

BRONNER'S PATENT GAS-BURNERS give 99 per cent. of light, as compared with 37 per cent. given by ordinary burners, with equal consumption of gas.—*Vide* "Gas Referees Report," published June, 1869.
HENRY GREENE AND SON, Sole Consignees of Brönner's Patent Improvements in Gas Lighting, 16 and 17, King William Street, E.C., and 138, Regent Street, LONDON. Agents wanted.

BELGIAN CLAY RETORTS.

J. SUGG and CO., late ALBERT KELLER, GHENT.—The removal of the import duties on Earthenware permitting the entry of Clay Retorts into England, Messrs. Sugg, of Ghent, beg to draw the attention of the Gas Companies of London, and other Cities, to the very superior quality of the RETORTS manufactured by them. They can be made of any size, in one piece, and of any form. The price will be in proportion to the weight, and very moderate in comparison to their value.
Communications addressed to J. SUGG & CO., GHENT, will receive immediate attention.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
WENLOCK IRON WHARF, 20 & 22, WHARF ROAD,
CITY ROAD, LONDON, N.,
Beg to inform Gas and Water Companies and the public, that they keep in stock in London all the CASTINGS in general use in Gas and Water Works, including Iron Retorts, Socket and Flange Pipes, Bends, Branches, and Syphons of all sizes, Lamp Columns, &c., &c.
N.B.—Orders for Cast-Iron Tanks, Girders, Columns, Cylinders, and all irregular castings, will have immediate attention. CHARLES HORSLEY, *Agent.*

OXIDE OF IRON.—We are prepared to supply, on moderate terms,
HYDRATED PEROXIDE OF IRON (BOG OCHRE),
Same quality as supplied by us to several of the most extensive Gas Companies, and which has given entire satisfaction.
FRANCIS RITCHIE & SONS,
BELFAST.

TROTTER, HAINES, & CORBETT,
BRETTELL'S ESTATE
FIRE CLAY & BRICK WORKS,
STOURBRIDGE.
Manufacturers of GAS-RETORTS, GLASS-HOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS. TILES, and every description of FIRE-BRICK.
Proprietors of
BEST GLASS-HOUSE POT and CRUCIBLE CLAYS.
Successors to
E. BAKER AND CO., LATE BRIERLEY HILL, STAFFORDSHIRE.

WATER-WORKS FITTINGS,
SLUICE-COCKS, FIRE-COCKS,
METERS, STEAM FITTINGS,
GAS & HOT-WATER VALVES, &c.,
Of First-class Materials and Workmanship.

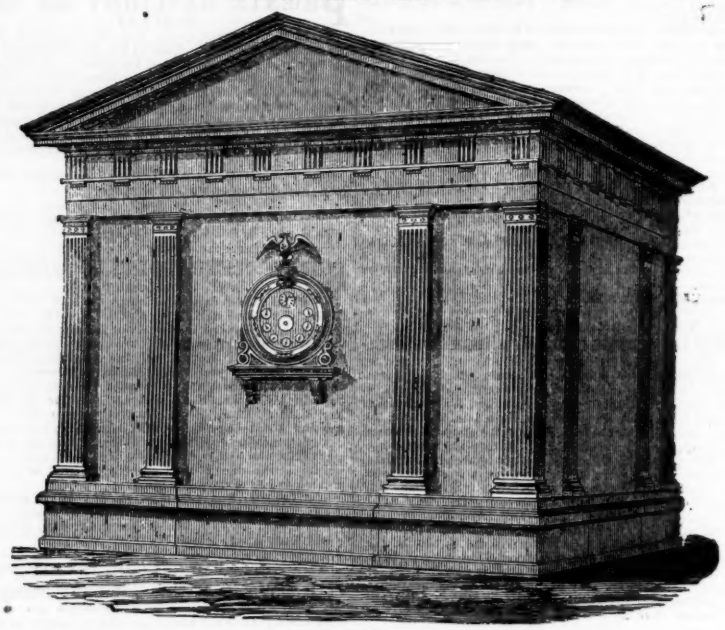
BECK & CO., Limited,
BRASSFOUNDERS & HYDRAULIC ENGINEERS,
GREAT SUFFOLK STREET, SOUTHWARK, S.E.
Illustrated Catalogues on application.

J. T. B. PORTER & CO.,
GAS ENGINEERS,
MANUFACTURERS AND CONTRACTORS FOR GAS-WORKS
Of any extent at Home and Abroad,
GOWTS BRIDGE WORKS, LINCOLN,
AND
5, QUEEN SQUARE, WESTMINSTER, S.W.

Established 1811.

READY & SON,
BILSTON STREET BRASS FOUNDRY,
WOLVERHAMPTON
MANUFACTURERS OF
SUN BURNERS, GAS CHANDELIERS,
HALL LANTERNS, BRACKETS, PENDANTS,
And every Description of
GAS-FITTINGS,
Including
MEDIÆVAL FITTINGS FOR CHURCHES, &c.
Large Pattern-Books complete, with Book of Prices, 7s. 6d.

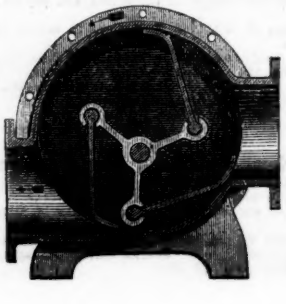
J. & J. BRADDOCK,
GAS ENGINEERS,
GLOBE METER-WORKS, OLDHAM,
MANUFACTURERS OF
IMPROVED CONSUMERS GAS-METERS,
Of the best material and workmanship, carefully adjusted to the requirements of the British Sales of Gas Act and Foreign Standards of Measures.
PATENT FIXED WATER-LINE GAS-METERS,
Which are uniform with the ordinary Meters, and register with minute accuracy.
IMPROVED DRY GAS-METERS,
IN BEST TINNED IRON CASES.



GAS STATION-METERS,
WITH PLANED JOINTS.
GOVERNORS, GAUGES, INDICATORS, EXHAUST-GOVERNORS, &c.
Home and Foreign Orders promptly attended to.
All Sizes of CONSUMERS METERS, STATION-METERS, and GOVERNORS generally in Stock.
Orders almost invariably despatched on the day of receipt.
TERMS, &c., ON APPLICATION.

SCHOLL'S
PATENT PLATINUM
GASLIGHT PERFECTER.

Extract from Report by Dr. Letheby:—
"The results have been very remarkable, for they show an average increase of 63 per cent. on the illuminating power of the gas. I am of opinion, therefore, that the invention is of great practical value."
Extract from Dr. Frankland's Course of Lectures at the Royal School of Mines, February, 1868.
"Scholl's Platinum Perfecter is one of the most important inventions of modern times in connexion with the burning of coal gas."
Price 1s. each for Fishtail Burners.
To be had retail of Gas-Fitters and Ironmongers.
JOHN SCHOLL, Manufactory: 41 & 42, BERWICK STREET;
Retail Depot: 198a, OXFORD STREET, LONDON, W.
Terms on application. N.B.—A specimen sent free on receipt of Twelve stamps.
*** Further testimonials from Drs. Frankland and Crooks, showing the great practical value of this invention, will be shortly published.



CHARLES HORSLEY'S
PATENT
GAS EXHAUSTER.
(From 250 Feet upwards per Hour.)
Also,
ROTARY TAR AND OIL PUMPS.
For particulars and prices apply to the Patentee,
22, Wharf Road, City Road, London, N.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

Station-Meters, Governors, Consumers Meters, Gas Lustres, Chandeliers, Brackets, &c., and every description of Gas-Fittings and Gas Apparatus.

TO GAS COMPANIES, ENGINEERS, BUILDERS, &c.

THE PATENT ANTI-GALVANIC PAINT

Is guaranteed to prevent and arrest Rust on all Ironwork, and to cover Tar most effectually. It is most valuable for protecting it from the action of salt water, rain, sulphurous and gaseous exhalations. It has been well tested at various Gas-Works, in covering Tar on Gasholders, Purifiers, &c., and has given great satisfaction.

Testimonials given if required, and sample cans for trial sent free of charge.

All communications to be addressed to

Messrs. STEVENS & CO., 156, CHEAPSIDE, LONDON.

LAW UNION

FIRE & LIFE INSURANCE COMPANY.

CHIEF OFFICE:

126, CHANCERY LANE, LONDON, W.C.

Capital—ONE MILLION STERLING,

Fully subscribed by upwards of 450 Shareholders, nearly all of whom are members of the Legal Profession.

CHAIRMAN—Sir WILLIAM FOSTER, Bart., Norwich.

DEPUTY-CHAIRMAN—JAMES CUDDON, Esq., Barrister-at-Law, Goldsmith Building, Temple.

The Capital subscribed and Funds in hand amount to upwards of £1,250,000, affording unquestionable security. The Directors invite particular attention to the new form of Life Policy, which is free from all conditions.

The Company advances money on Mortgage of Life Interests and Reversions, whether absolute or contingent.

Gas-Works insured against Fire and Explosion, and Coals against Spontaneous Combustion.

Rates of Premium from 2s. to 10s. 6d.

Prospectuses, copies of the Directors' Report and Annual Balance-Sheet, and every information sent post free on application to

FRANK M'GEDY, Actuary and Secretary.

CAROLINE VICKARY,

(ADMINISTRATRIX TO THE LATE JOHN VICKARY,)

GAS ENGINEER, CONTRACTOR, IRON AND BRASS FOUNDER,

EXE ISLAND, EXETER,

(Established Thirty years,)

Respectfully tenders her thanks to those friends who have patronized her since her late husband's death, and having secured an efficient staff for each department of design and manufacture, she refers with confidence to works recently erected by her as a guarantee that all orders she may be favoured with will be completed in a sound and satisfactory manner.

GASHOLDERS AND TANKS,

Retorts, Retort-Fittings, Condensers, Scrubbers, Purifiers, Station-Meters, Governors, Sluice-Valves of all kinds. (Gas and Water Mains always in stock.)

GAS-FITTINGS,

Including Chandeliers, Pendants, Hall Lamps, Brackets, Star and Sun Lights of all designs, embracing the Mediæval and other periods.

GAS-METERS (WET OR DRY),

Combining the most recent improvements in principle and manufacture; upwards of 150,000 already in work, giving the highest satisfaction. (A guarantee for five years given with each one.)

Every description of **Plumbers Work,** comprising **Water-Closets, Beer-Engines, Lift and Force Pumps, Cocks for Gas, Water, or Steam, &c.**

Drawings, Specifications, and Estimates of **Gas-Works, Iron Roofs, Bridges,** and light or heavy structures in wrought or cast iron, supplied on application.

C. & W. WALKER'S

DOUBLE-FACED GAS-VALVES FOR LARGE MAINS.

These Gas-Valves for large bores are specially constructed of unusual strength and solidity. The Valve itself is a rigid wedge of cast iron, having two perfectly scraped surface facings, fitting between the two in the body, which are also surfaced. They are guaranteed absolutely tight under any chemical or other test for mains of the largest diameter, at a very moderate price.

Midland Iron-Works, Donnington, near Newport, Shropshire; 8, Finsbury Circus, London.

"METER LIFE BOOK,"

By R. P. KEYS, Accountant, 26, BUDGE ROW, LONDON, E.C.

2nd Edition. Specimen Sheets, Illustrated, 3s. 6d.; will be 5s. shortly.

Has been adopted in England, Scotland, and Ireland. Simplest plan that has been projected.

FLETCHER AND MURPHY,

GARRATT STREET WORKS, OLDHAM ROAD, MANCHESTER;

Manufacturers of

IMPROVED CONSUMERS WET GAS-METERS

IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER,

AND

IMPROVED DRY GAS-METERS;

STATION-METERS OF ALL SIZES, with PLANED JOINTS;

GOVERNORS, PRESSURE AND EXHAUST REGISTERS, TEST HOLDERS,

And all kinds of Experimental Gas Apparatus.

SCOTCH CANNEL COALS.

The Subscriber is prepared to contract for the supply of all the principal SCOTCH CANNEL COALS. Prices and Analyses of the various Coals will be forwarded on application.

JAMES M'KELVIE,
CANNEL COAL MERCHANT,
HAYMARKET EDINBURGH.
Established 1840.

SWANWICK CANNEL.

The yield of this Cannel is liberal, the illuminating power large, and coke good.

For prices and terms, apply to

H. BOAM, 1, Darwin Terrace, DERBY.

INCE HALL CANNEL COAL.

LEE & JERDEIN,

COAL OWNERS AND MERCHANTS,

Sole Vendors of the Ince Hall Wigan Coal and Cannel.

Chief Office:

9, LANCASTER PLACE, STRAND, LONDON, W.C.

CANNEL COAL.—The West Yorkshire

Iron and Coal Company, Limited, beg to draw the attention of Gas Companies to their Cannel, of which the following is the analysis made by W. Huggon, Esq., F.C.S.:

Yield of gas per ton	10,296 cubic feet.
Illuminating power rather over	21 sperm candles.
Yield of coke per ton . . .	12 cwt.

The actual working, as reported by one of the largest gas companies in Yorkshire, gives results still more favourable, viz.—

Yield of gas	10,416 cubic feet.
Illuminating power	21·89 sperm candles.
Coke	The same.

We add from the same source the capabilities of the common gas coal—

Yield of gas	10,080 cubic feet.
Illuminating power	14·41 sperm candles.
Yield of coke	13 cwt.

COLLIERIES—WEST ARDSLEY, near LEEDS.

For further particulars, address to the Office of the Company, 15, York Place, LEEDS.

POPE & PEARSON'S GAS COAL.—

We have now the authority of several of the most eminent Gas Engineers of London in stating that our Coal yields *in practical working over* 10,000 *cubic feet of gas, with an illuminating power of* 16 *candles.*

One ton yields 12¼ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars, apply to POPE AND PEARSON, West Riding and Silkstone Collieries, near LEEDS.

OLD WEMYSS CANNEL COAL.—

Yield of gas per ton, 12,896 cubic feet; illuminating power, 31·75 standard candles. Port of shipment, Wemyss.

Analysis and price on application to Mr. WM. CAREY, Manager, Wemyss Colliery, Kirkcaldy, FIFE.

CANNEL COAL.

MESSRS. GRIFFITHS BROTHERS,

COPPA COLLIERY, MOLD,

Beg leave to call the attention of Gas Companies to the superior quality of their Cannel for gas-making purposes.

This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.

Ports of shipment—Birkenhead or Connah's Quay.

Waggons supplied for delivery by railway to any part of England or Wales.

For particulars, prices, and rates of freight, apply to GRIFFITHS BROTHERS, Coppa Colliery, Mold, FLINTSHIRE.

THE

HUCKNALL COLLIERY COMPANY

Can offer a CANNEL COAL yielding a large quantity of Gas of superior quality.

Prices and information on application to the HUCKNALL COLLIERY COMPANY, Hucknall Torkard Collieries, near NOTTINGHAM.

KIRKWOOD CANNEL COAL.

ANALYSIS—

10,538 feet of gas per ton of coal;
28 standard candles;
9 cwt. coke per ton of coal.

Shipped either at Forth or Clyde ports.

Particulars, price, &c., from JOHN MACDONALD, 131, Hope Street, GLASGOW.

FIRE-CLAY GAS-RETORTS, &c., CANNEL AND STEAM COALS.

WILLIAM FRASER, Inverkeithing

(owner of the Works at which Fire-Clay Retorts were first made), having greatly enlarged his Works, can supply RETORTS and other FIRE-CLAY GOODS to any extent.

References can be given to managers of above a hundred Gas-Works whom he supplies.

WILLIAM FRASER ships COWDENBEATH PARROT COALS at Charlestown and Burntisland at 11s. per ton; and HALBEATH STEAM COALS, on Navy List, at 7s. per ton.

ROBERT MACLAREN and CO.,

EGLINTON FOUNDRY, GLASGOW,

Manufacturers of all sizes of Cast-Iron Main-Pipes by an improved Patent, General Ironfounders, Gas Engineers, and Wrought-Iron Tube Makers.

ADDISON POTTER,

WILLINGTON QUAY,
NEAR NEWCASTLE-UPON-TYNE,

Manufacturer of Clay Retorts, Fire-Bricks, and every description of Fire-Clay Goods.

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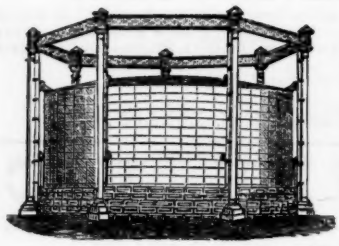

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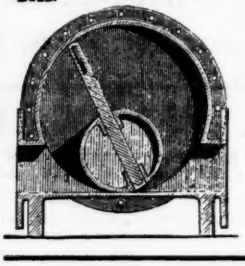

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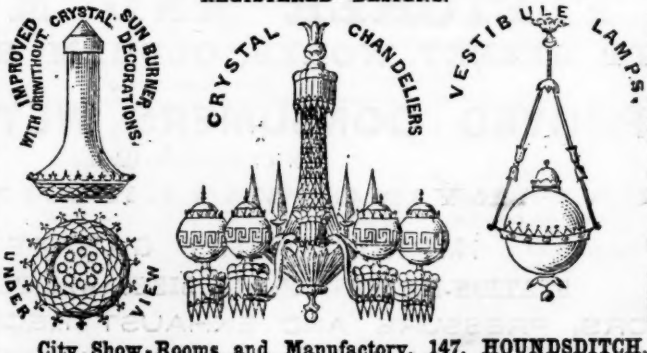

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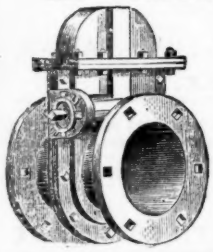

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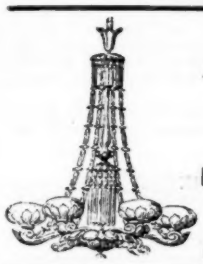

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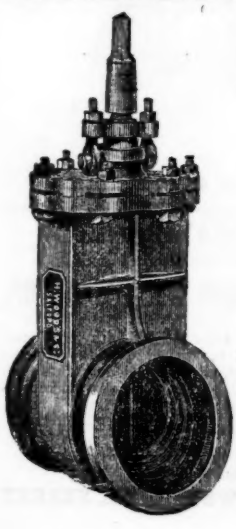

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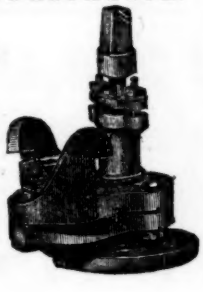

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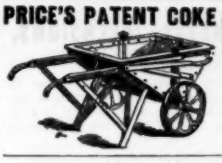

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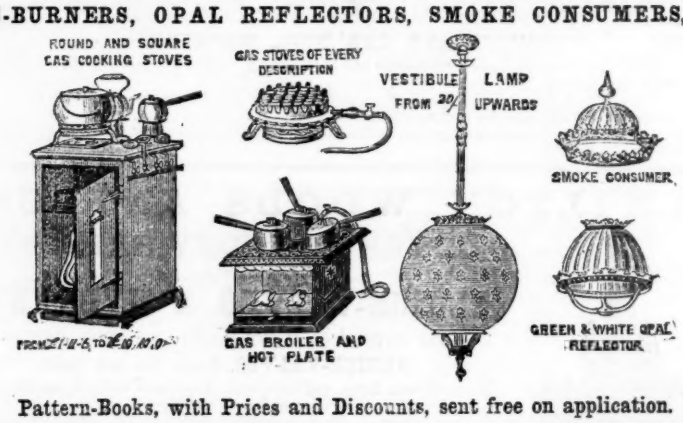
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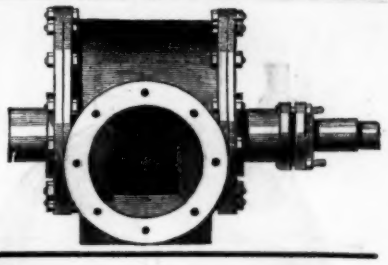

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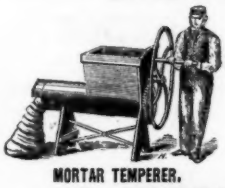
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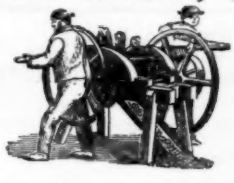
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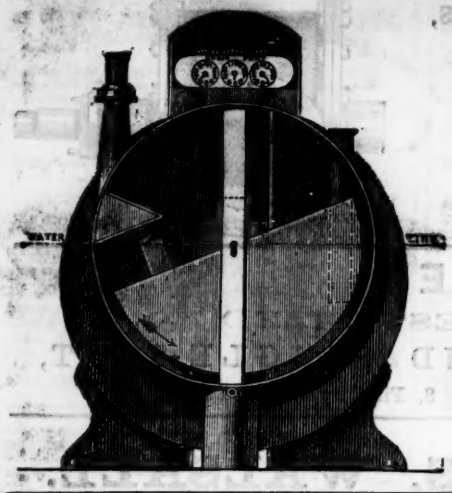

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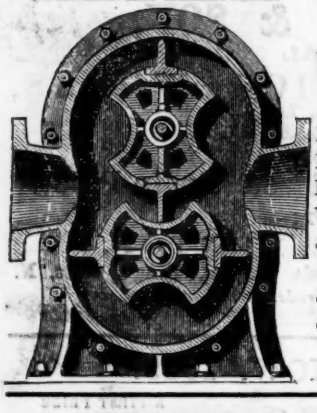

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